COAL AGE

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The inventor of the cash register gave his invention its "try out" at a coal-mine commissary. The owner of the establishment was so astonished at the unlooked for results that he decided that these machines had a brilliant future and forthwith he abandoned the commissary and turned his attention to cash registers. He has been interested in selling them ever since.

There are plenty of managers and bosses willing to denounce you as a fool or a crank if you so much as hint at any possible crookedness around their "diggings," and yet the first complete systematic audit of any mining company's affairs rarely fails to uncover irregularities enough to keep every one from the superintendent down to the office boy busy making explanations and suggesting changes.

There is nothing remarkable about this when you realize the difficulty of keeping in close touch with every one at a large mining operation who is responsible for entering up time and tonnage; neither should it be construed as a slur on the personnel of the coal-mining business as compared with other large industries.

There are three well known systems of obtaining easy money from coal-mining companies, and, strange though it may seem, year after year they are set moving and generally are carried to successful terminations, from the standpoint of the dishonest:

1.—Tipple weigh bosses enter into collusion with some of the miners and then credit them with as much coal as can be added to the actual tonnage sheets without exciting suspicion. At mines where part of the coal goes to ovens and the balance is shipped in cars, it is often difficult to obtain a check on the weighman's figures and his additions may assume an amazing proportion of the whole, over long periods of time. If the weighman's weights are checked by total shipments, it is still possible for him to short-weigh some men and credit his "pals" with a corresponding amount.

2.—Commissary clerks arrange with some of the employees who trade at the commissary to handle company checks for them and then instead of canceling the checks as they are presented, they retain them and pass them back out for circulation.

3.—Bosses of all kinds from coke-oven foremen down to boss trackmen have been known to pad their labor rolls and divide the profits with those who are in a position to conceal the irregularities from the paymasters.

In some camps all three systems have been discovered in action at the same time, while at others they have followed singly but with almost dizzy regularity.

Are the guilty ones punished when overtaken? Rarely.

The ill-gotten gains slip through their fingers almost mechanically and there is little or no chance to recover losses. Furthermore, in many such cases, salaried lawyers are frequently able to successfully oppose company prosecutions.

And so the loss is hushed up and the next-door neighbor is not warned of his danger.

MORAL: Auditors and red-tape experts are still useful citizens around many mining operations.

Use of Purchased Powers in Coal Mines

By H. D. Jackson*

SYNOPSIS—This is a problem which does not now greatly vex the mining industry. The day is not far distant, however, when it is destined to assume a position of considerable prominence. This article discusses some of the salient features in its consideration.

Electricity is rapidly superseding all other methods of supplying power to coal operations, except possibly in those locations where, owing to the gaseous condition of the mine, it is unsafe to carry the current into the underground workings. Even in operations of this character, electricity is used to a large extent in all operations where feasible.

The early installations were all of the direct-current type, operating at either 250 or 500 volts, and were employed mainly for lighting and haulage work. Pumps, fans, hoists, etc., were, and are still to a certain extent, operated by steam largely because the owners considered reliability of the greatest importance; and owing to their knowledge of what steam could do, they would rather trust it than the more recently developed electric motors. In case of an accident to a locomotive, it was a comparatively easy matter to put the mules again into service; but in the case of a break-down of the electric fan-motor, it was an entirely different matter.

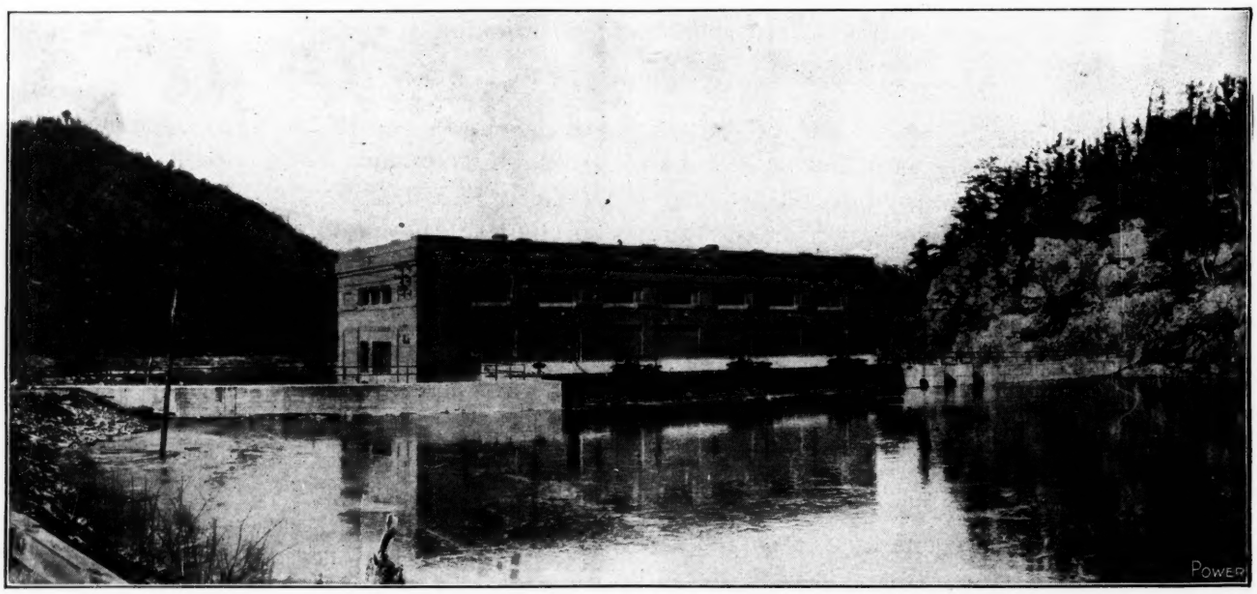

Fig. 1. A Typical Hydro-Electric Central Station, Viewed from Above the Dam

These Plants Are Still Operating

These plants having been built, they are, to a large extent, still in operation. The owners being conservative, and the mining work paying fairly well, the question of the cost of power was a secondary consideration. Today, however, things have changed, and the power-cost, including as it does a large item in labor and fuel is becoming more and more important.

There has been a vast increase in the number of mining developments, the modern ones of which are operating at a maximum of economy, with a consequent reduction in the cost of their product.

At the present time there is an element entering into existing conditions which is of interest to the mine owner. All through the coal regions wherever such schemes seem possible, there are being established central stations, the avowed purpose of which is the furnishing of power to the mines, at such a figure that by adopting this source of supply, those operations which are now finding it difficult to operate advantageously, will be enabled to successfully compete with the more modern plants which now make power for themselves.

The idea is that these generating stations by virtue of their size and location, and the fact that the peak loads on the different plants which they serve will probably not all come at the same time, can supply power cheaper than the mine plants can manufacture it themselves.

These new installations are carrying out an aggressive campaign to sell their product, and doubtless in many instances are securing business at a price that would warrant the investment. In other cases, however, it is seriously to be doubted if their power can compete with that furnished by the isolated plants. It must be remembered too, that the central station has to pay fixed charges on a high initial cost.

This is unavoidably the case since the installation consists not only of the generating apparatus, but also the transmission lines which are necessary for distributing the power to the various plants it supplies. It must also have a relay service in order to take care of any unit which may be shut down in case of an accident, so that the amount of its equipment is great, its load factor not good, and its fixed charges consequently high.

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In addition to this, the plant must have an organization for securing and carrying on the business, and a force to obtain necessary data for calculating and making out monthly bills.

All of these are excess items to be added to the ordinary expense of operation; so that, while it may be true that the purely manufacturing cost may be low in an installation of this character it does not necessarily follow that the total cost of power production, including all charges, is any less or even equal to that in many of the isolated plants.

Where the Central Station Has Its Greatest Advantage

It may be true, and doubtless is, that a central station can furnish current to one of the old type mining plants using electricity now solely for haulage purposes and supplying all its other power by means of steam engines located at more or less favorable points about the mine and at considerable distances from the boilers, but could it do so if this plant were rebuilt along modern lines?

This would not necessarily mean an entire reconstruc-

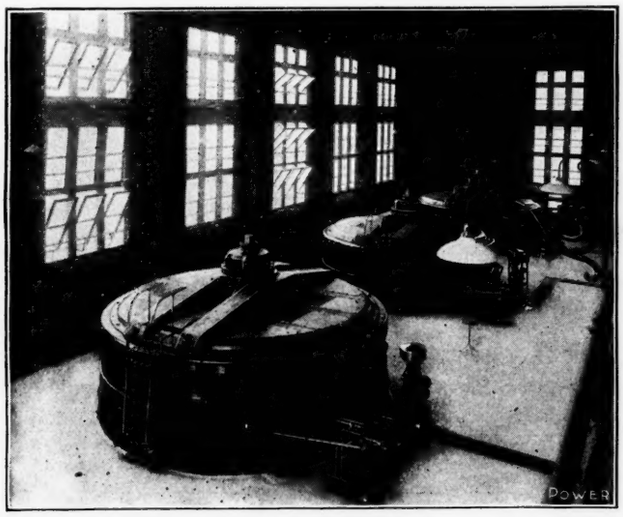

Fig. 2. Interior of a Power Plant, Showing Three Generator Units

tion of the plant, but in many cases might involve the replacing of the steam-driven pumps, hoists, etc., by electric ones. By doing this, practically all of the machinery requiring skilled attention would be centered in the power house, reducing largely the cost of attendance and also decreasing to a far greater extent the amount of coal required for operation, as fan engines, steam pumps, and steam-driven hoists are almost universally steam eaters.

It has long been known that steam engines operated at a distance from the boiler plant are exceedingly hard to keep in good running order, owing to the large amount of water unavoidably condensed in long pipe lines. This condition requires engines of large clearance, which are uneconomical in the extreme.

The condensation alone represents a considerable loss, and the difficulty of keeping the long pipe lines tight is in itself a large item. Engines of the character necessary for use where attention is small must of necessity be of the simplest and most rugged type. This means that they must be practically free from all the refinements which make them economical in the use of steam, and it would be natural, if every effort were to be made to operate with the maximum of economy, that machines of this character would be abolished.

The same is true of pumps which take steam full stroke, as they are probably more wasteful thermodynamically than any other steam-operated apparatus.

Therefore, it is advisable for the owner or operator of a coal mine, when this matter of purchasing power is brought up, to consider not only what it may cost him to supply power as he is at present doing, but also what it will cost him to furnish it from his own plant if modernized; and then compare that figure with what it will cost him if purchased.

He must not lose sight of the fact that although the present equipment may not be economical when the cost of its power is compared with that as offered by the supply company, there yet remains the opportunity of calculating the price of current if the plant were put in the best possible condition. The relative advantages and disadvantages of either alternative will then be clearly perceptible and a wise decision can therefore be reached.

The Cost of Introducing Purchased Power

The price of the apparatus necessary in order to use purchased power is by no means a small item, and when one takes into consideration that the machinery in use at present must be scrapped, or practically so, the cost of its introduction runs up still more, unless it may be that the plant which is abandoned has been so long in service, and so handled financially, that it has reached a point of no value; when its discarding would represent no monetary loss.

If, however, no depreciation allowances have been made, or if the plant has not been in operation for any considerable length of time, it cannot be scrapped without a heavy financial sacrifice. The fixed charges on this loss should be added to the cost of power as purchased from the central station in order to make a correct comparison.

The cost of power from an existing plant is represented by the fixed charges on its valuation, plus the operating expense; if purchased, its price is composed of the fixed charges on the machinery required for its utilization, the operating expense, the price of current, and the fixed charges on the difference between the cost of the original plant and the amount for which it is sold.

In case power is generated after remodeling the station, its cost is represented by the fixed charges on the total value of both old and new equipment, plus the operating expense, depreciation, insurance and taxes in all cases being included in fixed charges. Whichever one of these proves the smaller is certainly the one to be chosen.

Before contracting for power, the fixed charges as well as the rate at which current can be secured should be scrutinized with care and calculations made over a considerable range of load. Under certain conditions it will probably be found quite advantageous to purchase power from an outside source. Under others it might be equally desirable to generate it at the mine plant.

Some Unreduced Death Rates in Illinois

By John Dunlop*

SYNOPSIS—The death rates from roof falls and falls of coal, and that from mine cars show no sign of reduction in Illinois, though the decrease is apparent in other parts of the United States. The author of the paper is of the opinion that shooting off the solid has not been shown to be a more important source of accident from falls than certain other methods of mining.

There is a part of the mining death rate in Illinois which legislation, inspection and the work of the federal Bureau of Mines has been unable to reduce. This part is that due to falls of roof, coal and drawslate and to the mishandling of cars.

In the last year of record between June 30, 1911, and the same date in 1912, the deaths from falling rock, coal and drawslate amounted to 54 per cent. of all fatal accidents in coal mines. Mine cars were the cause of 19 per cent. of the accidents.

The number of nonfatal accidents in the state from falls of rock, coal and drawslate were in the same period 45 per cent. of all accidents and from mine cars 26 per cent. It is surprising to learn that the loss of life from these causes per million tons mined has remained almost constant since 1901.

Longwall Workings Have More Accidents and Less Fatalities

The number of nonfatal accidents per thousand men employed is greater in the longwall workings than in the room-and-pillar mines, but it is a redeeming feature that there are less fatal accidents. This is due to the coal being thinner. A piece of loose coal or shale of sufficient weight to injure a miner working in low coal would in all probability kill him if it fell from the roof of a seam 5 ft. thick or over.

The state inspectors have been insistent in recommending that face bosses be employed, and the provision would, I am sure, save many lives. But there is a feeling against their employment. The miners believe that they would be arbitrary in performing their duties. A number of the larger companies have employed such men, and I learn that the results are not as favorable as might be expected.

The superintendent of a coal company operating two mines, and employing about thirteen hundred men, states that face bosses have been at work only a year in his mines and he cannot tell whether they have done any good. The men are taking advantage of the compensation act and are reporting injuries and seeking medical aid in cases so slight that they would not have reported the accident had it happened a year ago.

This is his statement:

TONS MINED PER ACCIDENT

	No. 1	No. 2
1912	3857	1378
1913	2364	1144

Apparently more men are injured than before the hiring of face bosses, but also the increase may be due to the concurrent effect of the compensation law.

At No. 1 of the same company, the number of accidents for the last three months shows a decided decrease over those reported in the first three months of the fiscal year.

QUARTERLY RETURN OF ACCIDENTS, NO. 1 MINE

July, August and September	1912	72
October, November and December	1912	46
January, February and March	1913	39

It is true that more powder is used where coal is being shot off the solid, and it is probable that the roof is affected by the heavy shooting, but a careful perusal of the reports of the state inspector of mines shows that 60 per cent. of the men killed by falling coal, roof and drawslate are struck down in mines where the coal is almost all undercut by machine. As these mines produce only about 52 per cent.* of the total output, it seems that they have an undue proportion of accidents, and it is not fair to ascribe the maintenance of rate or increase in accidents to shooting out of the solid.

Hence, it seems by these figures that the use of electric machines has a more detrimental effect than shooting off the solid. If props are set at a sufficient distance from the face to allow proper clearance for the working of a machine, the distance is too great for safety, especially where there is a bad roof. Under conditions of this sort, which are general through the central and southern part of the state, props should be placed before the coal is shot, and if face bosses are employed, it would be their duty to see that the place was properly timbered before any shots were fired. It must not be taken for granted that because the inspectors have strongly recommended that face bosses be employed for each 100 men in the mine, that the supervision of these men would avoid accidents.

The Car-Accident Problem

To prevent accidents to drivers is a problem more difficult to solve. This subject was earnestly discussed by the Mine Investigation Commission, and they listened attentively to suggestions of all kinds and considered the feasibility of having a law enacted to prohibit the driver from riding on the tail chain. It was agreed that such a law would not be practical in all cases. They did recommend that in mines opened after the passage of the act then prepared, all mine cars should be equipped with a bumper or bumpers on each end, which should project from the end of the car not less than 4 in. This was only palliative, and would not remedy the evil.

Not long ago, I had occasion to investigate a fatal accident which occurred to a driver. I found that he had not taken the proper care to protect himself. He attempted to come down a grade with a loaded trip and did not take time to put in sprags, but undertook to hold the trip by placing his back against the car and his feet on the rails, allowing the trip to push him down grade. His feet slipped off the rails, and as the trip was traveling rapidly, he fell in front of the car, which ran over his body injuring him, and causing his death a short time after. In this case, it was a matter of speed at the expense of safety. To prevent accidents to drivers, we must always urge "More caution and less speed."

*State mine inspector, Third district, Peoria, Ill.

Abstract of paper entitled "Safety First from the Standpoint of the Mine Inspector," delivered at the mining conference held at the dedication of the Transportation Building and Locomotive and Mining Laboratories, University of Illinois, Urbana, Ill., May 8, 9 and 10.

*Although 44 per cent. of the coal in Illinois is machine-mined, these same mines produce 4,230,077 tons of hand-mined coal and 51.8 per cent. of the whole tonnage of the state.—Editor.

A Gas Ignition Controversy

By J. W. Powell*

SYNOPSIS—A reply to questions propounded by James Ashworth, in regard to ascertaining the most probable cause of the second explosion in the Bellevue mine, Dec. 9, 1910. An account of a careful and detailed investigation of the mine by Mr. Powell, Jan. 20 and 21, 1911, followed by his theory of the explosion and its cause. Experiences in heavy-roof caves in mines in Pennsylvania and elsewhere.

In answer to the request of James Ashworth, Coal Age, Mar. 1, p. 344, I will recount my theory of the second Bellevue mine explosion, Dec. 9, 1910. I was the superintendent of the mine at that time, having resigned my position as district mine inspector of Alberta, eight days previous to the disaster.

The verdict of the coroner's jury, based upon Mr. Ashworth's evidence as mining expert, stated that the disaster was caused by the percussion of air, due to the caving of rock over chutes Nos. 76 to 78. Feeling that the responsibility of reopening and operating this mine devolved upon me as superintendent, and not feeling satisfied that this verdict was in line with the facts, I was anxious to ascertain for myself the true cause of the disaster.

After some persuasion I prevailed upon the pit boss, J. Anderson, who had served in that capacity practically since the opening of the mine six years previous, to accompany me in making an inspection of the mine. Mr. Anderson claimed that the workings were liable to cave again and with more disastrous results than before, owing to the great accumulation of gas. In this prediction he was correct, as was proved by the third and more violent cave and explosion, which occurred five days after our inspection was completed.

Referring to Fig. 1, starting Jan. 20, we first examined all points on the counter entry from No. 45 chute outward to No. 43 chute, where this entry was caved tight. We found a large amount of dust on the timbers, ribs and floor of the entry. The force was outward as shown by the direction in which the timbers were blown. Inby, from chute No. 45 to No. 49, there were large quantities of dust but no signs of coking. I found the force was upward through chute No. 45 to the surface. Going down chute No. 45 to the main entry and along that entry to chute No. 58, we examined the counter entry and section above as far as chute No. 70, proceeding at some points nearly up to the fourth crosscut. This section was slightly caved at different points and there were large quantities of dust on the fallen rock and floor and evidences of a slight coking on the corners of some of the coal pillars.

Going back to the main entry, we entered chute No. 72 and examined the counter entry in this section as far as chute No. 80. From the center of the pillar between chutes Nos. 76 and 77 as far as chute No. 79, there was no cave of roof rock, as was previously supposed when this section was examined Dec. 13, which examination was hurriedly made. I went up chutes Nos. 75 to 78, inclusive, as high as the fourth cross-pitch, and found but a slight cave crossing chutes Nos. 75 and 76 and extending about 25 ft. above the first crosscut. There was some coking in evidence on the caved rocks in this section and a slight coking appeared on some of the posts in chute No. 76.

Proceeding along the counter entry to chute No. 85, I found a large quantity of dust deposited on the bottom of this entry and on the timbers, but no coking was visible. The force of the explosion in this section was inby, as indicated by the stoppings and the boards on the sides of the coal chutes. Going down chute No. 85 to the main entry, we traveled the main entry to the face at No. 129 and returned by that entry to the mouth of the mine.

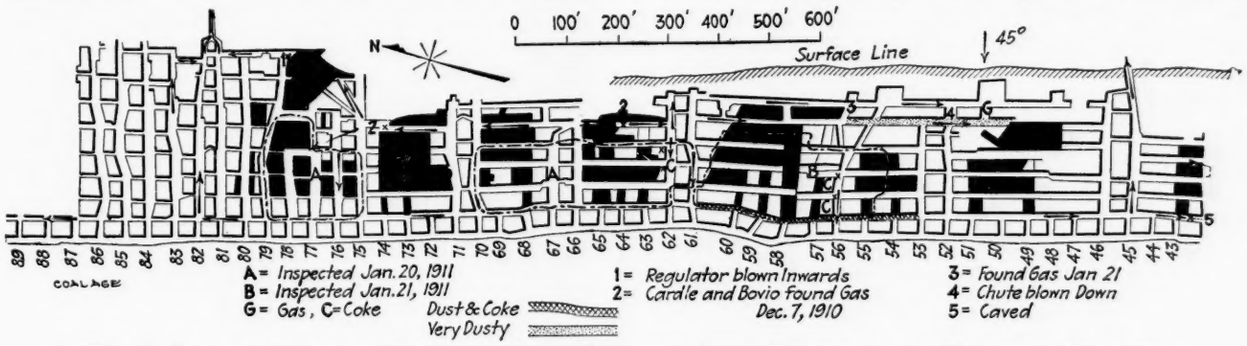

Fig. 1. Plan of Part of Bellevue Mine, Showing Areas Inspected and Points of Interest

The next day, Jan. 21, as indicated in Fig. 1, in company with J. Anderson, pit boss, and Frank Lewis, driver boss, I proceeded up No. 53 chute to the counter entry and along that entry to between chutes Nos. 60 and 61, where we found this entry blocked tight with coal that had been put there for a stopping to turn the air up over the workings above. This stopping had not been disturbed. There was a large amount of coking along the counter entry, between chutes Nos. 53 and 58, and a board nailed on one of the posts near chute No. 57 was charred, showing it had been subjected to a great heat. In this entry there were large globules of coked dust all along this section. You could pick up cakes of coked dust as large as your hand. Both Mr. Anderson and Mr. Lewis stated that this coking was the result of the second explosion, as they had traveled through this section many times after the first explosion and before the second oc-

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curred, and were certain that there were no signs of coking then at that place. At chute No. 54 a car was tilted up, which they claimed was caused by the second explosion.

The force evidently came down chutes Nos. 56 and 57 and passed outward along the counter entry as there were no signs of coking on the corners of the pillars at the mouths of these chutes. Going up chute No. 56 and returning down chute No. 54, I found little caving in this section. I then went up chute No. 52 to the fourth cross-pitch. After building a ladder I tried to go up to the fifth cross-pitch, but was prevented by a body of gas 8 or 10 ft. above the high side of the cross-pitch. Then going back through the fourth cross-pitch to No. 56 chute, I again tried to get up the angle chute to the fifth cross-pitch, but again encountered gas at about the same height as before. We then crossed over to a point between chutes No. 57 and 58, but could go no further, as the large excavation above this point made it unsafe to proceed, and we returned by the fourth cross-pitch to No. 52 chute and thence to the main entry and the mouth of the mine.

Roof Caves and Air Percussion

Now, in respect to air percussion due to heavy caving of roof in mines, I wish to recall an experience I had in the anthracite region of Pennsylvania, in the Whites vein seam, at Williamstown, Dauphin County. The mine was operated by the Summit Branch R.R. Co. The roof of the mine was a strong, tenacious conglomerate that would hold over a large area without caving, until, finally, as the work progressed, the roof would begin to weight and, for several days before the cave would take place, it would snap and crack, and there were loud reports similar to those of rifle shots. You could hear the cracking crossing through the roof over the solid pillars similar to the cracking of ice traveling across a large pond. This was warning for everyone to get away at a respectful distance as, when it caved, there was always a great rush of air to such an extent that the sheet iron lining the chutes would sometimes be lifted and carried before the blast and twisted around props in its path. I want to say that at such times I never experienced any heat in the rush of air, nor did anyone else. On the contrary, the air was cool like a cold wind.

In Carbonado, Wash., I experienced several large caves in mines, where explosive gas was present in the old workings, I recall one experience in No. 7 mine, which was very gaseous, when the mine foreman and myself, sitting on one of the counter entries, eating our lunch, felt a great concussion accompanied, a few seconds later, by a great rush of air. Thinking that there had been an explosion in some portion of the mine, we proceeded at once to make an investigation. Meeting some of the men we were told that heavy cave had occurred in some of the pillars. The nature of the rock in this mine differed from that in the Bellevue mine, as it did not emit sparks, and there was consequently no explosion.

In Coleman, Alberta, I experienced a number of large caves in No. 2 seam. Some of these were of larger proportions than the one at Bellevue mine on Dec. 9; but I never heard of anyone feeling any heat in the rush of air that always accompanied a cave of any extent. I am told further, by Mr. Anderson, that a very heavy cave once occurred at Bellevue mine, in a section around No. 29 chute, and, in comparison with this, the cave of Dec. 9, was but a drop in a bucket. The cave caused a great rush of air and a concussion that made many think an explosion had occurred; but there was no development of heat and no explosion. The question may be asked if the roof cave, Dec. 9, produced heat sufficient to ignite the gas, why did not the previous cave, which was much greater, also produce heat and ignite gas?

Reflecting on these facts, I came to the conclusion that this disaster (Dec. 9) was not caused by percussion of the air; but that it was due to gas ignited by sparks emitted from the roof rock while "weighting," just before caving took place; or from the striking of the rocks against each other as caving occurred. The dust blown into the air undoubtedly distilled carbon monoxide, which propagated the flame of the explosion. It is a well known fact among the miners at Bellevue that the roof rock is capable of emitting sparks when struck or when falling. It has also been proven, in a reliable way, that these sparks are capable of igniting firedamp. That there was also an ignition of dust is confirmed, in my mind, by the fact that, while leading the first rescue party not more than three-quarters of an hour after the explosion occurred, I encountered smoke at No. 76 chute. The smoke was the same dull-gray color given off by a newly made bituminous coal fire and had a similar smell. It was not the mist that sometimes accompanies explosions of gas. Andrew Matson stated, in his evidence at the inquest, that he recognized the smell of smoke "a little like gas from a stove," from chutes Nos. 107 to 90, and that this got stronger as they advanced to the outside. There was also a smell similar to that of burning coal coming from the air shaft at No. 82 chute, for several weeks after the explosion. In fact, at one time, we were afraid that there was a fire burning in the mine, and I went down through No. 82 air shaft, Dec. 23, to ascertain, if possible, whether this was true: but I could find no indication of fire burning. The smell gradually became weaker as the air current carried it out of the mine.

Where the Explosion Originated

In my opinion, gas was ignited by sparks emitted by the rock that caved at the surface pillar, in the neighborhood of No. 65 chute above the fourth cross-pitch. This was one of the points where gas was found by Cardle and Bovio, Dec. 7, two days previous to the explosion. These men stated, in their evidence, that they discovered gas in this place, by standing on the loose rock lying on the floor of the seam, and raising their safety lamps to the roof; but were unable to estimate the amount of gas, owing to the broken state of the roof and the large excavation in the surface pillar above. I have shown, in Fig. 2, what I think was practically the condition of the roof in this section, near the surface pillar. In my opinion, any weighting of the roof, which is always accompanied with a grinding action, would have emitted sparks sufficient to ignite the body of gas that undoubtedly was accumulated in this place when the cave occurred. According to their evidence, the roof in this place was in a dangerous condition, at the time these men made their examination, and made it unsafe for them to venture across to chute No. 74.

Inasmuch as the cave, if any occurred in chute No. 76, was small, and since the men working on pillars Nos. 80

and 81, close to that chute, reported no weighting of the roof that day when they came off shift, only four hours previous to the explosion, it is reasonable to suppose that the explosion originated in the section between chutes 65 and 74, where the heavy cave took place. It is worthy of mention that, owing to the peculiar nature of the roof here, it gives considerable warning before caving, and the men at work there would certainly have known if there had been any movement in the roof above them. On the other hand, the weighting of the roof, in the section above chute No. 65, could not have been heard, as this section is abandoned.

Path of the Explosion

The large winged arrows in Fig. 1 are intended to show, in a general way, the direction in which the force

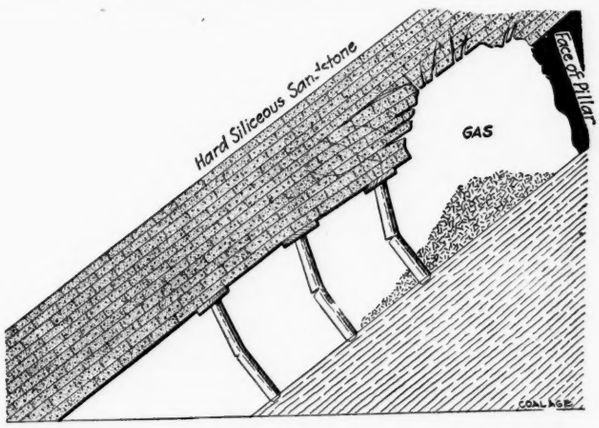


Fig. 2. Showing Condition of Roof, Where Explosion Is Assumed To Have Started

of the explosion traveled, from its point of origin above chute No. 65. Following the arrows the explosion traveled inby along the top of the workings, igniting any gas present at No. 74 chute, and blowing inward the regulator between chutes Nos. 79 and 80, and passing out through No. 82 air shaft, to the surface. Branching from this course, as shown by the arrows, some of the force of the explosion passed down through the robbed-out portion, to the counter and main entries, depositing coked dust on the rocks and the floor of the seam around chutes Nos. 75 and 76 and on some of the posts at this point. Passing along the counter entry, part of the force traveled up chutes Nos. 82 and 83 to the air shaft, while another portion continued inby along the counter entry.

Outby, the force of the explosion extended along the top of the workings, through the fourth and fifth cross-pitches. There was considerable force in evidence along the fourth cross-pitch from chute No. 57 to chute No. 49. Chutes and timber were blown out, and one of the men, who lost his life on the cross-pitch outside of chute No. 52, was buried under the débris so that it took several hours to find the body. At this point, an empty dump car was blown up on end. As shown by the arrows, the force split at chute No. 52, a part going down through this chute, tearing out the chute and manway in its path, to the counter entry. The other part traveled along the fourth cross-pitch and passed down through chute No. 49, to the counter entry; then passing outby along this entry to chute No. 43, where there was a cave completely blocking the entry. Much of the force of the blast here passed up chute No 45, to the surface. The force of the explosion also extended downward to the counter and main entries, at different points between chutes Nos. 65 and 53.

The fact that the bodies of men found on the fourth cross-pitch, just outside chute No. 52, showed signs of being subjected to great heat but no flame, indicates to my mind that the flame of the explosion was here extinguished by expansion in the large area of open workings. The men here were subjected to a rush of hot air and dust, as the blast extended outward along the fourth cross-pitch, and down through chute No. 49, which was the outlet, at the end of this cross-pitch, leading to the workings below. Men who were on the counter entry, at chute No 45, when the explosion occurred told me afterward that the rush of air and dust coming from the inside workings felt hot. It had evidently cooled off much before reaching this point.

Replying to Mr. Ashworth's Questions

My account thus far, and theory of the disaster, will practically cover points Nos. 1, 2, 11 and 15, submitted by Mr. Ashworth, Coal Age, Mar. 1, p. 344. I will endeavor now to answer briefly the remaining questions in regular order, as follows:

3. There was no evidence, as far as I remember, to show that there was any accumulation of gas at a point between the third and fourth cross-pitches, above No. 73 chute.

4. I found No. 73 chute slightly damaged.

5. This chute being but slightly damaged would not, in my opinion, indicate positively that no explosion occurred on top of this chute, 300 ft. up the pitch. That would depend on the direction of the force of the explosion.

6. Not having read the article by Stirling and Cadman, on this explosion, I cannot answer this question.

7. Yes. These pillars were all intact, with stoppings in all crosscuts except the top one, which was left open to allow the air current to pass through.

8. The pillars working on the day of the disaster were Nos. 76, 77, 78 and 79. These were the only pillars, to my knowledge, working in that section, at the time.

9. Cardle and Bovio stated that they found a small quantity of gas over chute No. 74.

10. As previously stated, I have not read the article to which you refer, but am of the opinion that the only gas that entered into this explosion was that which was accumulated in pockets above the fourth cross-pitch, and which was above the path of the ventilating current.

12. I plugged No. 84 charging station in order to turn more air into the inside charging station, where the miners were assembled who were later rescued. The charging station plugged was blown off at the T where it branched off the main line.

13. No. 53 chute was blown out completely and all the coal it contained was piled on the main entry. No. 52 chute was blown out from the fourth cross-pitch down to the counter entry. This chute was a network of timbers, sheet iron, etc. We found this chute completely blocked with débris just below the fourth cross-pitch. The coal drawn from the chute 24 or 26 hr. after the explosion occurred was very hot when drawn. The cross-pitch on the south side of No. 52 chute was strewn with timber and coal that was blown out from this chute. I

noticed no signs of great heat at this point, but the dust on the corner of No. 52 chute felt rough and cindery to the touch; otherwise, there was no indication of heat or coking.

14. No. 52 chute was used for dumping coal from the fourth and fifth cross-pitches above. I have already described the condition of this chute from the counter entry to the fifth cross-pitch. The chute was not damaged below the counter entry, but was protected by the large amount of coal it contained.

16. Not having read the paper to which you refer, I cannot answer this question.

17. I was unable to get up to and examine the fifth cross-pitch, on account of the accumulation of gas. Chutes Nos. 45 to 52 were intact. Chutes Nos. 53, 54 and 55 were blown down, and a considerable amount of coal and timber was lying on the entry at the foot of these chutes. There was very little damage done from chutes Nos. 56 to 62, but all of these chutes were more or less ruptured and had to be repaired the night of the explosion, in order to enable us to convey the air current along the main entry to the inside workings. The chute that was driven off the rock tunnel at No. 62, and connected with the counter entry of No. 1 seam at this point, was blown down completely, the timbers and coal being piled up in the rock tunnel, at the foot of the chute, which demonstrated there was quite a force exerted downward at this point. We put a curtain across the rock tunnel outside this chute the night of the explosion, to prevent the air current short circuiting at this point.

I believe this answers all of Mr. Ashworth's questions.

❋

A Safety Latch for Shaft Gates

On page 464 of our issue of Mar. 22, 1913, there appeared two photographs of a safety latch for mine gates as used by the H. C. Frick Coke Co. As some of our readers have made inquiry about this device, we deemed it advisable to describe it in greater detail.

The object of this safety latch is to prevent the gate at a shaft landing being opened, except when the cage is in the proper position. Fig. 1 shows a plan and side elevation of the assembled device.

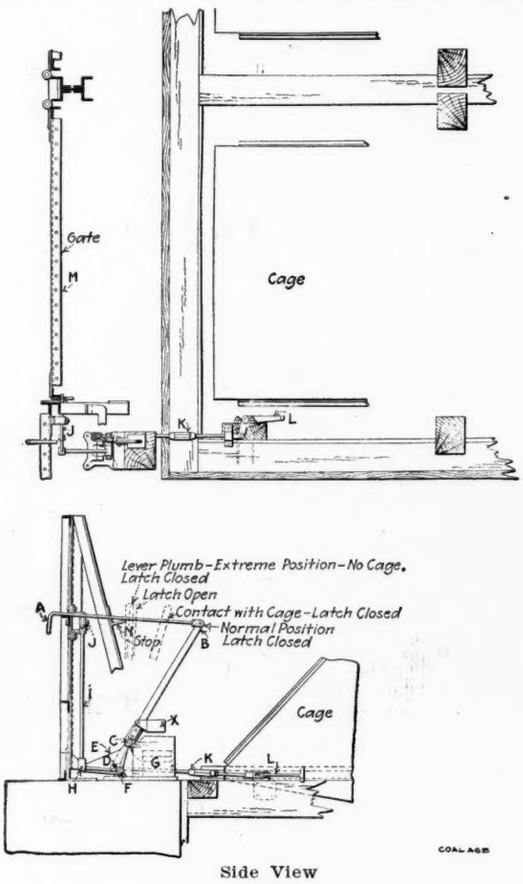
A is the hand grip or operating lever. This is connected to *B*, which is pivoted at *C* to the rocker *E*, while at its lower end it is connected at *D* to the adjustable rod *K*.

The rod *K* is connected to the bell crank *L*, which is pivoted to a stationary fulcrum on the framing or timbering of the shaft. The rocker *E* above referred to is pivoted at *F* to a stationary fulcrum attached to the landing. *E* is also heavily counterbalanced by the weights *G*, which, under ordinary circumstances, hold it in the position shown. At the point *H*, *E* is connected to the rod *I*, which, at its upper end, is pinned loosely to the latch *J*.

Suppose now that the hand grip *A* is pulled when the cage is not at the landing. The lever *B* is free to move forward as far as the stop *N*, the only effect being that the point *D* will be pushed backward, causing the rod *K* to revolve the bell crank *L* through a certain angle.

Suppose now that the cage is in the proper position at the landing. If the grip *A* is now pulled, the lever *B* will move forward and the bell crank *L* revolve until it comes in contact with a suitable plate placed upon the side of the cage. When this takes place, the bell crank *L* can move no further, and the lever *B*, instead of pivoting at the point *C*, now pivots at *D*. A further movement of *A* tilts the rocker *E* about the point *F*, raising the counterweights *G* and pulling down the point *H*, which, in turn, through the rod *I*, opens the latch of the gate, which can now be swung outward and cars or men admitted to the cage.

After a car, we will say, has been pushed upon the



Side View

MECHANISM OF THE SAFETY LATCH FOR SHAFT GATES

cage, the grip *A* is released, and the lever *B* allowed to swing backward. The counterweight *G* upon the rocker *E* now returns to its original position, closing the latch. The small counterweight *X* upon the lever *B* also pulls the latter to its original position, which rotates the bell crank *L* back from the cage and out of the way along the side of the shaft.

The cage can now be raised or lowered without interfering with any part of the latch mechanism, and the gate is closed and will remain closed until the cage is again brought to its proper level when pulling the rod *A* will again makes contact between the cage and the bell crank *L*.

A further refinement, and one which is not shown upon this drawing, is that of connecting the rocker *E* with a system of rods and levers, which can be made to actuate a pair of chocks located at a sufficient distance in front of the gate to allow the latter to swing open and which will hold a car until the cage is in position.

This device was invented by one of the employees of the H. C. Frick Coke Co., and a patent upon it has been applied for.

An Oklahoma Water-Hoist

By E. C. Reeder*

SYNOPSIS—A description of the means employed to remove water from an old mine that threatened to break into and flood a newer operation. The expense of handling this water by bailing was decidedly less than by the use of pumps.

Oklahoma has several important coal fields, practically all of which are in the east central part of the state. Title to most of the coal lands is vested in the Indians, who receive substantial royalties from the mining companies.

One of the largest and most important of these coal fields is the McAlester, named after Col. McAlester, one of the pioneers of this region. The town of McAlester is also named after him and is the metropolis of this part of the state. It is located adjacent to several of the large mines and is served by both the Rock Island and Missouri, Kansas & Texas lines of railroad which give outlets north and south as well as east and west.

The largest of the mining companies in this region is the Osage Coal & Mining Co. who also operate several large mines in the Wilburton District to the east of McAlester.

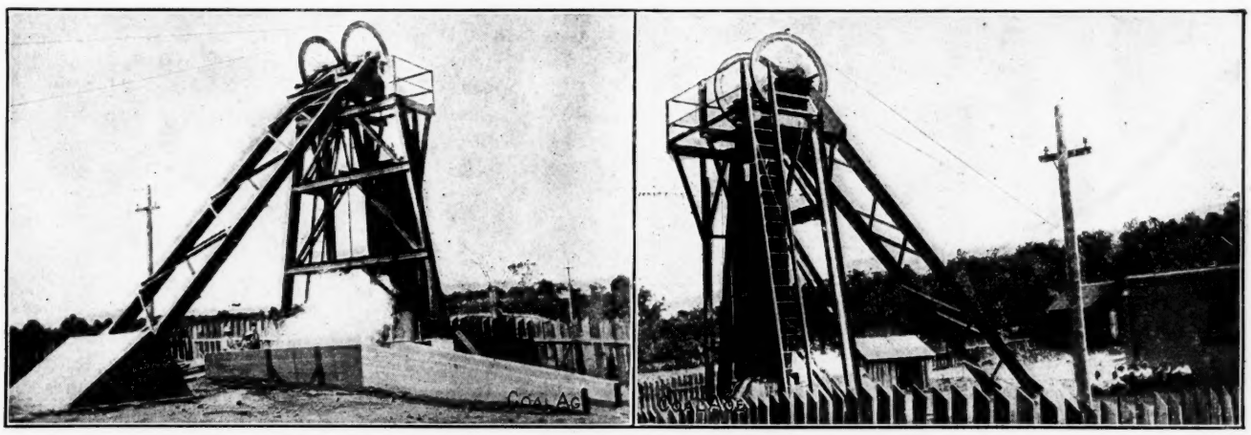
At McAlester the coal beds outcrop in a number of places and dip at a fairly uniform angle to the southwest. The angle of inclination varies only slightly but usually flattens with depth. There are several workable seams of coal, a distance of some hundreds of feet existing between the uppermost and lowest beds.

At the village of Krebs, some three miles from McAlester, the Osage company has several large mines mostly opened on the upper seam which here averages about five feet thick and dips to the southwest, the angle at the outcrop being about 15 deg., flattening to about 6 deg. at a vertical depth of 800 ft.

The Necessity for Water-Hoisting Apparatus

Cutting into the Osage company's acreage is the property of an older concern, the greater part of whose coal has been mined out and the workings abandoned and allowed to fill up with water. The Osage company is connected with the old workings at a point about 490 ft. vertically from the shaft mouth where an electric turbine pump was located which took care of the overflow from the old mine, pumping to the surface through a drill hole. As the workings of the new mine got deeper and approached these old workings below the water level, apprehension was felt that the entries might break through and be flooded, particularly as no reliable maps of the old mine were in existence.

The shafts and slopes of the old mine were in bad condition, being practically impassable and a great deal of work and expense would be entailed if the old mine were to be pumped out by the ordinary methods. It was finally decided, after much study, that the best plan was to sink a new vertical shaft, tapping the old workings at their lowest point and either install pumps or bailers to handle the water.



Front and Rear Views of Headframe with a Bailer Discharging in Each Case

A two-compartment shaft, 5 ft. by 9 ft. 9 in., inside the timbers was sunk through the shales overlying the coal at this point. It was estimated that the coal was down about 774 ft., and the shaft was stopped at a point approximately 736 ft. from the surface. The timbering was then completed, buntons put in, guides strung and the shaft finished so a cage could be run in either compartment.

About this time (November, 1910) the Osage company decided that it would install a hoist and handle the water with self-filling and self-emptying bailers, raising the same with an electric engine. This machinery was accordingly contracted for.

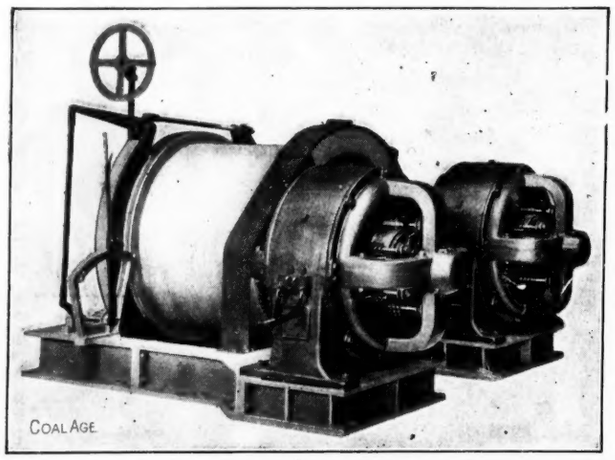
The work of finishing the shaft and tapping the water was then carried forward and completed. When the timbering was finished a churn drill was erected on the surface and a 12-in. hole drilled from the bottom of the shaft into the old mine workings. After drilling about 40 ft. the drill broke through and the water rose in the shaft to within 500 ft. of the collar.

The drill outfit was then removed and the bailing machinery erected and connected up. The bailers themselves are 3 ft. 10 in. in diameter and 12 ft. 3 in. long, built of $\frac{5}{16}$-in. plate and hold 1000 U.S. gallons. There are two

*Mining engineer, Chicago, Ill.

valves in the bottom about 14x18 in. in area, hinged on one side to open inward. One valve is connected by rods to the tripping mechanism which automatically opens it at the surface when the trip comes in contact with a guide runner placed for that purpose. The discharge of water is directed to the side by a spout attached to the bottom of the bailer.

The other valve is used for filling purposes only as both open automatically when the bucket enters the water. The bailers discharge as soon as the spout attached to the bottom clears the collar. A concrete wall surrounds the shaft and forms part of the receiving basin into which the water runs to be carried off finally by a ditch.



THE HOIST AND ITS TWO DRIVING MOTORS

A structural-steel head frame 25 ft. high, to the center of the sheaves surmounts the shaft. This carries the head sheaves and the tripping runners for emptying the bailers. The photos show the general construction of the head frame, also the bailers discharging.

HOIST DRIVEN BY DIRECT CURRENT

The hoist is arranged for operation with direct current at 600 volts, the railway circuit of the Choctaw Railway & Lighting Co. passing within a short distance of the plant. For several reasons it was decided to use two motors on the hoist with master control and magnetic contactors arrange for series-parallel operation.

One reason for using two motors was that it might be desirable to operate over indefinite periods at reduced speed, and another that in case of accident to one motor there would still remain the other for operation at either reduced speed or load.

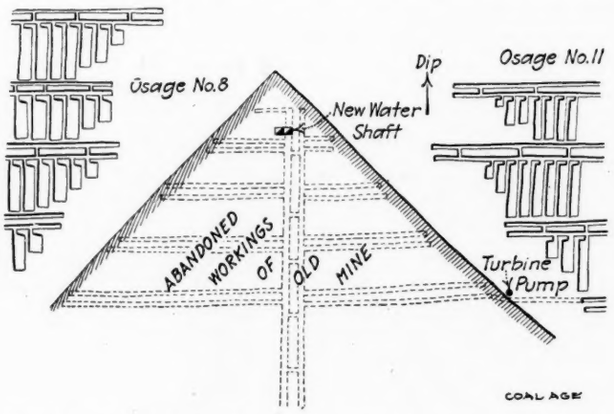
The motors are of the General Electric manufacture, 175 hp. rating, type CLC, 350 r.p.m., with commutating poles. They are geared direct to the drum shaft, the ratio of reduction being 6.1 to 1, giving a rope travel of approximately 1100 ft. per min. at full speed.

The ropes are both wound on a single drum 72 in. in diameter by 55-in. face, machine grooved for 1-in. rope, one part winding on as the other winds off. The drum gear is bolted to the drum at one end and on the opposite end is located the brake which is of the post type, operated by hand.

The operator stands on a platform at the rear of the hoist, where he commands a view of the bailers as they discharge as well as the hoist and motors. All the machinery, including the head frame, buckets and hoist, was built by the Lidgerwood Mfg. Co., of New York.

The plant was put in service in July, 1911, and has been worked continuously ever since. It has been found that operation for 10 hr. during the day is ample to keep the water level down to about 700 ft. from the surface, and the greater part of the time the hoist operates with the motors in series, running at approximately half speed and bringing up a bailer full of water about every 1½ min. On test at full speed they have hoisted a bailer every 50 sec. and kept it up for several hours, but when running at this rate would bail out the shaft in 3 or 4 hr.; hence it was found more economical to run at a slower rate.

When handling their water by means of the turbine



MAP SHOWING OLD WORKINGS AND POSITION OF PUMP AND WATER HOIST

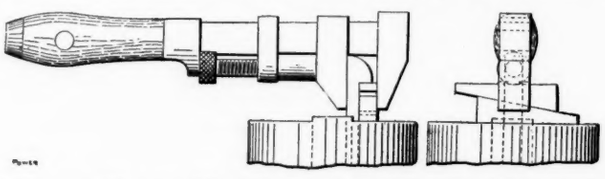
pump it cost the coal company about 4c. per 1000 gal., but since the installation of the water hoist this has been reduced to about 1¾c. per 1000 gal.

Several other mines in the district are preparing to handle their water by a method similar to that above described, and the operation of this plant has been closely watched by the parties interested in similar properties.

Removing Solidly Driven Keys

Those who have trouble in removing head keys from the valve-gears of Corliss engines and other places will find that all trouble may be avoided by adopting the following method of removing the keys, says **John F.** Hurst, in *Power* of June 10, 1913.

Place a monkeywrench over the key as shown and insert a compound wedge between the jaws of the wrench and under the head of the key. By applying a pressure



SHOWING USE OF WRENCH AND WEDGES FOR REMOVING KEYS

to the end of the wrench and at the same time driving the wedges, or cold chisels, whichever is used, the key will slowly but surely come out.

Coal Mining Institute of America Meeting

By R. Dawson Hall

SYNOPSIS—The courtesy of the Pittsburgh officials and the wealth of opportunity for study in that city made the meeting of the institute most profitable to all in attendance. The program, though improvised, was of great interest.

The change of place of session from Wilkes-Barre to Pittsburgh at the last minute could not fail to have its effect in reducing attendance and it was somewhat surprising that so many persons came to the meeting despite the fact that the program was hastily framed at the last moment and might be expected to show some evidences of that haste.

Everyone believed the change in venue was justified, not so much because the attendance would have been small as because the executive committee had no way of being assured of the number of persons who would probably be present. It is certain that several members had decided to attend who either did not want to avail themselves of the special train service from Pittsburgh or were too negligent to make reservations.

H. C. Frick Coke Co. Safety Exhibit

There was no program provided for a morning session, so the regular meeting did not commence till 2 o'clock in the afternoon of June 17, being held in the Assembly Hall of the Engineers' Society of Western Pennsylvania. Mr. Keller, of the H. C. Frick Coke Co., delivered the regular lecture which he is accustomed to make to the miners at the company's various plants, accompanying it with stereoptican slides illustrating different accidents and the means by which they may be prevented. The pictures show not only the right way, but also the wrong way of doing certain kinds of work and also the accidents resulting from following the wrong methods.

The result of the training seems to justify the company in its expenditure. Fatal accidents in the Frick mines are far less numerous per million tons produced than in England, Scotland or the United States, as was shown by some diagrams presented. The real merit of that fact was, however, not made plain. The H. C. Frick Coke Co. is mining the Pittsburgh bed almost exclusively and this seam is regarded as having an exceptionally dangerous roof. The remarkable record was made, therefore, despite adverse conditions.

Pennsylvania Possesses 5 per Cent. of the Coal and Mines One-Half

John W. Boileau then delivered his address on the "Pittsburgh Coal Field," illustrating it with a large map of the seam, showing its extensions in West Virginia and Ohio. He has measurements of the coal bed compiled from drillings throughout the field and perhaps no one knows better than he the characteristics and values of every portion of this coal territory. His address is abstracted as follows:

"The bituminous coal fields of Pennsylvania produce nearly 160,000,000 tons per annum. This constitutes one-third of all the coal produced in the United States. But this does not represent the whole coal output of the state for the anthracite production is about 90,000,000 tons.

"In the Pittsburgh district proper more than 60,000,000 tons are mined annually, but when the product of the Connellsville district, Fayette and Westmoreland Counties is added, the tonnage is 100,000,000, or approximately one-fifth of the entire tonnage of the United States. This includes coal sold as coal and coal made into coke. The coke region itself will produce 21,000,000 tons of coke each year, to manufacture which 32,000,000 tons of coal must be mined. The coke tonnage will probably increase 5 to 7 per cent. per annum.

"Pittsburgh and the manufactories in the Monongahela, Ohio and Allegheny Valleys within a short radius of that city form the greatest coal-consuming district in the world. While we consume in the Pittsburgh district proper 16,000,000 tons, we use enough in the form of coke to raise that figure to 25,000,000 tons.

"Pennsylvania has only about 5 per cent. of the coal area, but the state is producing nearly half the output of the entire United States. Consequently, the early exhaustion of the coal resources is to be expected, particularly of that part of the coal which is suited for coking or the manufacture of gas.

"Our great railroads are consuming immense quantities of coal and half the iron industry is located in Ohio and Pennsylvania so that the Pittsburgh bed will be rapidly exhausted. One large railroad alone uses six acres per day. The total acreage requirement of the United States is more than 325 acres daily. It is to be regretted that this exhaustion is not replaceable like that in agriculture; there is but one gleaning. If all the coal produced in Pennsylvania were drawn from one of our largest counties, like Greene or Washington, the coal in those areas would last only 8 or 10 years."

The Conditions Determining Coal Thickness

The discussion largely centered on the relation of coal thickness to the direction of the main basins and anticlines resulting from the Appalachian uplift. Mr. Boileau stated that the basins usually showed thicker coal than the anticlines and some were disposed to believe that this was an indication that the main uplift was in process of formation when the Pittsburgh bed was laid down, because the lower coal beds do not thicken in those synclines which have that particular direction. For instance, the basins which show thick coal in the Kittannings are those which run east and west and not northeast and southwest. Mr. Boileau declared that the thickness of the coal varies along the basins as well as across them and that the summits of the anticlines are sometimes eroded. The irregularity of the sulphur content was also discussed, but its presence could not be subjected to forecast, its occurrence being more irregular than that of the coal.

Visits to Points of Interest

The institute then adjourned to the offices of the weather bureau and H. Pennywitt, the local forecaster,

explained the methods by which the weather was predicted. The visitors climbed to the top of the Farmers' Bank Building, where the weather conditions are measured, the actual readings being taken in the offices below.

June 18 the members met at the Carnegie Museum and were shown through the exhibition rooms and the laboratories. As a rule, such a trip is wearisome in the extreme and not to be compared with an unconducted trip. However, with W. J. Holland, the curator, and D. Stewart, his assistant, as guides no such weariness was possible. Drs. Holland and Stewart have made the exhibit what it is, have traveled long distances to secure and excavate the specimens and are, moreover, brilliant conversationalists, their enthusiasm and extensive knowledge making every exhibit of interest.

Talking through Adam's Apple

In the afternoon a trip was made to the Bureau of Mines, where a lengthy program had been prepared. J. W. Paul demonstrated the use of rescue apparatus in the smoke room and showed how the telephone could be operated by attaching it to the throat of the rescuer. As this vibrates with the vocal chords, it is possible to use its motion to actuate the transmitter. The rescuer, therefore, speaks in the confines of his helmet and not directly in front of the diaphragm, but the instrument being attached to the throat receives and delivers the message nevertheless.

Mr. Paul also showed the action of a modern safety lamp in a mixture of air and 8.6 per cent. of explosive gas moving at a velocity of 2500 ft. per min. The flame left the wick and went up into the gauze. Then placing an unbonneted lamp in the same mixture, moving at 1500 ft. per min., he showed that it was extinguished. The Davy lamp in the same mixture exploded, though the velocity of the air current was reduced to 600 ft. per min. Passing one by one into a dark room, the visitors compared the cap of the naphtha-bonneted lamp with that of the Davy lamp in 2 per cent. of methane.

Simple Detonator Test

The nail test for determining the strength of detonators was then exhibited by C. Hall. The detonator is tied beneath a finishing nail and ignited through a fuse. The explosive bends the nail and the action measures the force of the detonator correctly. This is not true of the Trauzl block which has hitherto been the recognized method of measurement. The method invented by Mr. Hall has certainly the merit of simplicity. He exploded two detonators, one a No. 3 and the other a No. 6, and the difference in the angle to which the nail was bent was easily manifest. Weak detonators fail to produce the full strength of the powder to be detonated.

O. P. Hood described the experiments being made to determine how much of each kind of gas is exhausted by gasoline motors in every condition of working. A motor is being tested in the laboratory, but in the field the conditions of working are being ascertained so as to discover what effect the gasoline engine has on the atmosphere in a mine.

The bureau is testing carbon-dioxide recorders for determining the operating efficiency of boiler and other furnaces. The various types under test all showed the same record during the visit, but it is said that there is some lag in changing the record when the operating conditions change.

Portable Electric Lamps for Mine Use

H. H. Clark exhibited several portable electric-mining lamps, including the C. E. A. G. lamp, which has just been approved. He showed that a spark caused by a break in a current of 10 amp. at 15 volts made a large and brilliant spark. Despite the long period during which the flash was continued in the presence of gas, no explosion resulted. A smaller spark at a higher voltage ignited the gas as soon as discharged. Sparks of low voltage will not ignite methane unless the current is extremely high.

G. S. Rice announced that the state of Colorado had just passed a law requiring that oil safety lamps shall only be used for testing purposes after Jan. 1, 1914, and requiring the use of electric lamps for ordinary mining purposes. This law is to be of effect when the bureau shall determine the electric lamps which are safe for mine use.

A visit was made to the large testing machines of the Bureau of Standards. A test was being prepared of a large rock pillar, surrounded by concrete and bound by iron bands. The rock was piled loosely and filled with sand by flushing. The purpose is to ascertain the strength of the loose rock when it is confined and prevented from sliding sidewise under pressure. A yellow-pine prop about 8 in. in diameter was tested in another machine and failed under a total load of 77½ tons. The failure was wholly at the bottom and the prop was in such condition that it could be sawn off and used in a thinner bed or in a place when a shorter prop would serve. This sawing off and relocating of crushed props is effecting large economics for the Philadelphia & Reading Coal & Iron Co.

At the close of this exhibit, the meeting disbanded without further formalities.

Chilean Coal Importations

The quantity of coal imported into Chile has increased in the past few years, having doubled during the last decade; 1,577,000 tons were imported in 1912, practically all of it coming from England and Australia. At present the importation of coal from the United States is prevented by the lack of any line of ships running directly to this country. With the opening of the Panama Canal and the establishment of a fleet of ore-carrying steamers between Chile and Philadelphia, it is expected that there will be a better opportunity to sell American coal in that country, as, no doubt, the ships would take return cargoes at low rates.

Hirsch Electric Mine Lamp Approved

The Bureau of Mines has approved the safety electric miners' lamp, manufactured by the Hirsch Electric Mine Lamp Co., of 221-227 North Twenty-third St., Philadelphia, Penn. This is the first cap lamp approved by the Bureau. The battery is carried on a belt around the waist of the operator and the lamp is connected by a flexible pair cable passing over his back. The light is thus easily handled by the workman and does not interfere with his work.

Notes on the Groundhog Coal Field

By Amos Godfrey*

SYNOPSIS—The Groundhog coal field is situated in northern British Columbia and contains a large amount of high-grade coal that will come into competition with the Alaskan coals in the Pacific Coast markets. A few facts concerning it are given in this article.

The Groundhog coal field is in northern British Columbia, in the Cassiar district, and lies between 56 and 57 deg. north latitude, and about 128 deg. west longitude, covering an area about 30x45 miles in extent. The nearest town is Stewart, 90 miles away, as the crow flies, on the Portland Canal, but the town from which all supplies must be obtained is Hazelton, on the Skeena River, which is about 150 miles by trail from the coal fields. Supplies are taken up the Skeena on the ice in winter and on pack trains in the summer, both of these methods being expensive and uncertain.

In 1903, James McEvoy, formerly of the Canadian Geological Survey, took a party into the Groundhog country and staked 12 claims. In 1904, W. W. Leach went in with a party and staked four additional claims for the same company. F. A. Jackson was a member of both of these parties, his work being the hunting of caribou. On his hunting trips Mr. Jackson noticed other outcrops which the Western Development Co., for whom he had been working, did not take up. In 1909 he decided to stake his discovery. James Latham and Mr. Jackson went in during July with four horses, two pack and two saddle horses. They staked 14 claims, which were taken over by a syndicate calling itself the British Columbia Anthracite Syndicate, which was later merged into the B. C. Anthracite Coal, Ltd., claims having been added as prospects warranted until the company now owns 66 claims in all.

The next one to take an interest in the Groundhog region was Leon Benoit, of Winnipeg. In the fall of 1910, R. C. Campbell Johnson went in to examine Mr. Benoit's holdings and in 1911 took in a large party and did considerable work opening some fine anthracite coal. Since then many stakings have been made until now there are some 1500 square miles of territory staked out. No doubt much of this territory is barren.

In September last the B. C. Anthracite Coal, Ltd., had some thousand feet of tunneling driven in the several seams, the longest tunnel being 182 ft., one fault and one roll having been encountered, but in both instances the coal was normal on the other side. J. A. Challoner, writing in December last, reports upon one seam that there is 6 ft. of good, clean coal.

Character of the Coal

The geological age of this field has been classed by the Canadian Geological Survey as cretaceous, the exact position in that age not having been fully determined. The classifications of the coal by D. B. Dowling's method of split volatile ratio, are anthracite, semi-anthracite and anthracitic in character. In this connection George Watkins Evans states in a report: "From the above analysis we find that the coal field contains what can actually be classed as anthracite. It is claimed by men who have criticized the field that there is no anthracite present. I think the above partial summary should convince anyone that anthracite really does occur." The government reports upon the coal show that it is variable in the amount of fixed carbon that it contains, that constituent running from 40 to 85 per cent. and averaging around 60 per cent.

No. 4 "A" Trail Creek, Opposite Jackson Camp

Tunnel on Outcrop on Telfer Creek

Railroads into the Region

The Provincial Government has granted several railway charters. One proposed railway from Nasoga Gulf to the coal fields would be in the neighborhood of 200 miles long and traverse the Naas River valley, which has great agricultural possibilities. This road would be called the Naas & Skeena Rivers R.R. Another charter has been granted for a road to start in the town of Stewart on the Portland Canal, called the Canadian Great Eastern. This, too, would enter the upper reaches of the Naas River and possibly be laid along Currier Creek, the mouth of which is the center of the field. The length would be approximately 120 miles. Fourteen miles of this are already in operation up Fair River from Stew-

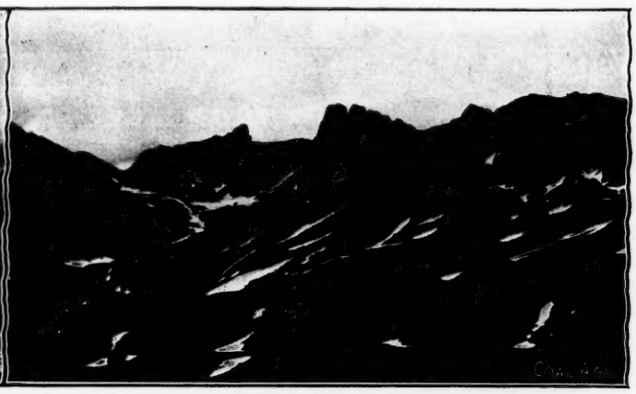
*Manager B. C. Anthracite Coal, Ltd., Groundhog P. O., B. C.

art. Another route would be a continuation of the Grand Trunk Pacific, which is in operation from Prince Rupert to Hazelton. This would follow the Skeena River from Hazelton to the coal field, the distance being approximately 200 miles and the grade would be in favor of loaded trains. The Naas & Skeena Rivers R.R. has one divide to cross, the Canadian Great Eastern has two, so, although the initial expense of the Grand Trunk Pacific would possibly be greater, it has the advantage that the actual cost of haulage would be less.

Market for the Coal

It has been thought that the opening of the Panama Canal would start a market for an immense amount of coal from this field. Moreover, the cities of the Pacific Coast are making great strides. In fact, there has been a shortage of coal in Vancouver recently, showing that a portion of the output of this field would find a market in the near-by cities along the coast. Moreover, the interior of the province is making rapid progress which will also take care of some of the output.

Coal Outcrops on Barney Creek



Alvo Mountain, Showing Basal Conglomerates

Some views are given which were taken in the Groundhog region, the first figure being a view of No. 4A Trail Creek, opposite the Jackson camp, where some prospecting has been done. This shows a drift in the bank along the creek on a coal outcrop. The second picture is of a drift which has been driven into the coal on Telfer Creek. In this the inclination of the strata can be seen dipping about 30 deg. N. E. Fig. 3 is of a stripping of the outcrop on Barney Creek, where some good anthracite coal was found. The character of the country can be seen from the background. Fig. 4 is a picture of Alva Mountain, and shows the basal conglomerates which underlie the region.

Mine Holidays

The numerous attempts which have been made to compile a list of mine workers' holidays in the anthracite coal region of Pennsylvania have so far been a complete failure. In view of the many recent "Button" and other strikes these frequent holidays are becoming an increasing source of loss and annoyance to the operators.

Capt. W. A. May, president of the Pennsylvania Coal Co., recently stated that he could never tell when a miners' holiday was coming or how many men it would involve. His company has no less than 29 nationalities on its payrolls and each has holidays peculiarly its own.

A recent compilation of the nationalities of the mine workers in the anthracite region gave them as follows: American, English, Welsh, Scotch, Irish, German, Slavonian, Italian, Polish, Hungarian, Austrian, Swedish, Russian, Belgian, Bohemian, French, Finnish, Canadian, Lithuanian, Greek, Tyrolean, Danish, Syrian, Montenegrin and Horwat. The workers classified as "American" include all of those born in this country even if their parents were foreign and did not speak a word of English, and several groups, like the Slavonians, are capable of still further subdivision.

The worst feature of these holidays is that, in many cases, the mine workers do not notify their foreman in advance, and to keep the numerous foreign holidays in his head, taking into account the changing nationalities of the shifting labor, a foreman would have to be a sort of human almanac. The celebration of most of the holidays also implies a second day off for those who have celebrated too well.

As long ago as 1906 the Lehigh Valley Coal Co. presented this difficulty as a matter for consideration to the Board of Conciliation, but the two grievances were withdrawn.

"Shooting off the Solid"

Advance sheets of his report for 1912 show that John Laing, chief of the Department of Mines, makes the proud boast that "shooting off the solid" has been nearly eliminated in West Virginia.

Government statistics show that more than 48 per cent. of deaths in coal mines are due to falls of roof. One of the causes of these falls is "shooting off the solid." A shot in the solid seam is also more likely to blow out the tamping so that the flames may set fire to coal dust or gas, thus causing an explosion that may wipe out scores of lives. In other words, reckless miners deliberately risk their own lives and the lives of others to save labor.

This dangerous practice has been discouraged in West Virginia by a vigilant system of inspection backed up by prosecutions of offenders. The 1911 report of the chief of the Department of Mines shows that 105 miners were fined an aggregate of $1303 for shooting off the solid in that year. This vigorous enforcement of the law evidently had its effect in 1912.

Our British Coal-Mining Letter

SYNOPSIS—The Rufford accident has called attention to the need for ladders and automatic hoisting control in shaft sinking. The tonnage of English mines per man employed has not decreased, despite the shortening of the hours of labor, and the increased remoteness of present operations from the shaft bottom. This uniformity of production is the result of the greater use of machinery. The utilization of the exhaust from steam engines in low-pressure turbines is an important source of the increased power in British collieries. Underground fires in Wales are found to occur frequently in the shales of the roof.

The hoisting accident at the Rufford shaft, related on p. 453 of COAL AGE, has aroused much question as to the need for ladders in shafts which are in process of sinking. It will be remembered that, owing to the fall of a water bucket, the scaffold beneath the workmen broke. They fell into the water and, probably, several of the 14 killed, perished by drowning.

Rope ladders have been suggested as furnishing the best mode of escape, but it was pointed out that if four ladders had been provided for 18 men, five or six, perhaps eight or ten, would have tried to reach one ladder, which could hardly serve as even a life line for them all. It was made apparent in the inquiry that an automatic controller should have been installed. This would have reduced the speed 42 ft. from the top of the shaft and have stopped the bucket on the surface. It was suggested that an emergency engine should have been provided so that the men could have been removed regardless of the disablement of the regular hoisting engine used for sinking purposes.

Mechanical Power in Mines

Taking as his subject the development of mechanical power in the mines of the northeastern coal field, R. Nelson, chief electrical inspector of mines, addressing the North of England branch of the Association of Mining Electrical Engineers, recalled the important part which mechanical power has played in enabling the coal-mining industry to meet the demands made upon it.

In 1911 there were in operation 511 collieries in Northumberland and Durham, and they produced 56,401,343 tons of coal, while the number of workmen employed was 216,733. Thus 260 tons were produced per person per annum. Comparing the figures for 1844, when the use of mechanical power was limited, with those for 1911, the number of workmen and the output had each been multiplied by about six, an indication of the extent to which the use of mechanical power had aided the development of coal mining, seeing that the output per man was almost maintained, although the daily hours of labor in coal mines had been reduced one-half ,and despite the fact that the more remote and less easily worked coal is now being mined. As regards the output per colliery, the figure for the year 1844, namely 77,600 tons, was increased to 110,000 tons by the year 1911.

Mr. Nelson then proceeded to say that the present century has so far witnessed nothing in mining comparable with the wide adoption of electricity. Motors totalling over 100,000 hp. are now at work in the mines of Northumberland and Durham. For the various operations of pumping, coal cutting and coal conveyance, electricity now stands preëminent, and a modern installation of electric motors may be made a thoroughly mechanical job, well able to withstand rough usage. Further, the apparatus may be so protected that if the current is rightly used, that is to say, only where the risk of accident arising therefrom is, so far as can be seen, negligible, the standard of safety is as high as that to be attained by any machinery in any situation.

Utilizing Steam Exhaust

The question of utilizing the power of exhaust steam is one which arises in the experience of most colliery managers, and as A. Benson reminded the Midland members of the National Association of Colliery Managers, in nearly every case the plant installed for this purpose necessarily includes a condenser. If electrical energy or compressed air is used at the mine, the most convenient way of dealing with the exhaust steam from the hoisting or other engines is to use it in a low-pressure turbine for driving electrical generators, or for actuating air compressors. Other circumstances might arise where more power is required from non-condensing engines such as the engine driving a fan, and in this case the difficulty might be met by installing a condenser of a suitable type. The advantage derived from the use of a condenser, as Mr. Benson stated are: A saving of steam of from 20 to 40 per cent, increased power of steam engine, economy of boiler plant and a supply of hot, pure feed water for the boilers.

Underground Fires

In a paper before the Scottish Institute of Mining Students, W. A. Taylor explained that apart from spontaneous ignition of the coal, fires may be caused underground by (1) ignition of timber resulting from the careless handling of naked lights; (2) badly constructed motor rooms, in which inflammable material is in too close proximity to starters, motors, cables, etc.; (3) the heating of timber or coal by steam pipes. The precautions to be taken where there is any danger of fire, suggested by the late Mr. Pickering, are recalled as follows: (a) Withdrawing as much timber from the waste as possible; (b) packing the waste as tightly as possible; (c) paying great attention to the building of side packs; (d) leaving as little coal standing as possible; (e) keeping the workings cool by means of an adequate amount of ventilation.

Blaes, a blue shale, is undoubtedly a primary cause of fires. During the past year the railway fill at Wellesley Colliery, near Methil, which is largely made up of blaes, caught fire in two places. Other embankments in the vicinity have also caught fire. A short time ago a fire took place at Rosie Colliery, belonging to the Wemyss Coal Co., in which the blaes overlying the Chemiss seam was found burning at the edge of an old pillar.

Hoisting Engineer's Eight-Hr. Day

British hoisting engineers now have their hours of employment regulated by law, the Home Secretary prescribing June 30, 1913, as the date after which a hoisting engineer may not be employed for more than eight hours in any one day, except as provided by general regulations.

Benham Coke Works, Wisconsin Steel Co.

By J. R. Foster*

SYNOPSIS—A small plant turning out a good product from beehive ovens. Two beds of coal are worked, the product of one being made into coke while that of the other goes to the market as a domestic fuel. Considerable attention is given to the sanitation of the town and the safety of the employees.

The coke works of the Wisconsin Steel Co. are situated on Big Looney Creek in Harlan County, Ky., 79 miles from Middlesboro on a branch of the Louisville & Nashville R.R. The plant proper is so located that it does not mar the beauty of the town and still is within short walking distance of all the laborers' homes.

The Geology of the Coal Beds

The region drained by the Poor Fork and Clover Fork of the Cumberland River includes the southern slope of the Pine Mountain and extends from the confluence of these two streams to Proctor Fork, a distance of about 38 miles, its extreme width being about 9 miles. Big Black Mountain, lying along the center of the region, is the most prominent feature of its topography, rising to a height of 4500 ft. above tidewater. This is the highest point in the state.

Except on the narrow flats of Poor Fork only the larger creeks have bottomlands wide enough for the economic location of coke ovens. The seams of coal in this field are divided into the upper and lower groups. Those of the lower productive group are locally designated as A, B, C and D, and are of varying section and value in the property.

Fig. 1 shows the relative distance between the seams. This group with associated rock is about 200 ft. thick. The bed A, or Harlan seam, is the lowest coal measure which has proven of any commercial value. The B seam is from 110 to 115 ft. above the A. The C, or Keokee bed, lies about 40 ft. above the B, while the D, or lower splint, is the highest of this group, lying about 75 ft. above the B.

An analysis of coal from the Keokee, or C seam, shows the following approximate results: Volatile matter 38 per cent., fixed carbon 58 per cent. and ash 2¼ per cent. The coke produced from this material contains about 1 per cent. volatile matter, 94 per cent. fixed carbon, one-half of one per cent. sulphur and a trace of phosphorus.

In many respects this coal bed resembles the Elk Horn seam of the Kentucky River section but no connection can be made between the two because of the disturbance made by the upheaval of the Pine Mountain shown in Plate 1. This coal is the one now being coked at this plant. Its height in Benham Spur averages 5 ft. 8 in.

The D, or Low Splint seam, is now operated by the company for domestic and foreign market purposes and gives the following test: Moisture, 5.012 per cent.; volatile combustible, 35.54 per cent.; fixed carbon, 52.002 per cent.; ash, 6.7855 per cent.; sulphur, 0.635 per cent.; phos., 0.025 per cent. This seam averages at the outcrop a height of 4 ft.

Only One Seam Is Coked

As stated above, the company is at present working two distinct beds of coal, one 60 ft. above the other.

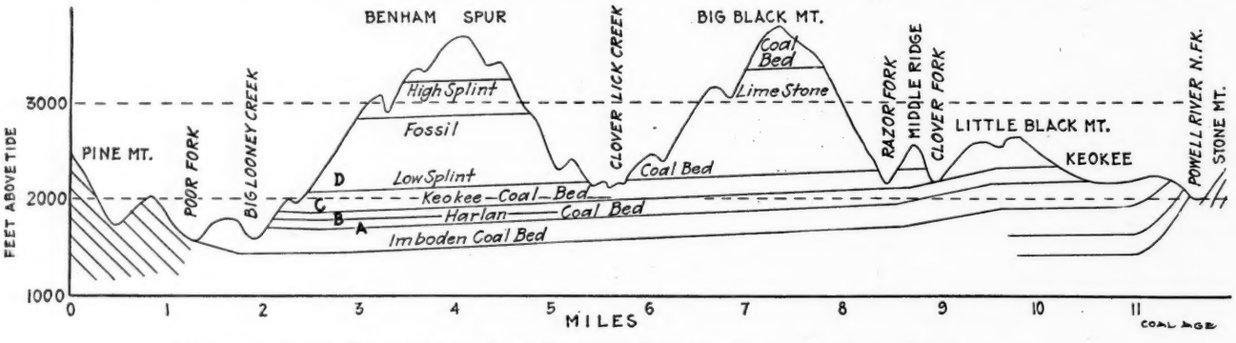


Fig. 1. Cross-Section of Coal-Bearing Strata near Benham, Ky.

Each has a separate tipple. The upper seam is worked entirely for domestic purposes and the market, none being used for the manufacture of coke. The coal is lowered to the tipple by two monitors of 5 tons capacity each, running on a three-rail, gravity incline. It is passed over gravity screens, making three sizes of coal.

The other or lower tipple is equipped with two Jeffrey swing-hammer crushers of 1500 tons capacity each. The maximum size of the crushed coal is ¼ in. and all crushing is done dry. A bin of 1200 tons capacity takes care of the fine material.

At present there are 300 coke ovens of the beehive type in operation and 108 under construction, requiring on the average 1400 tons to fill with 48-hr. charges.

All the machinery of the lower tipple is run by electric power except the crushers, which are driven by two steam engines of 150 hp. each. The power plant consists of a separate power house, equipped with two 250-kw. 250-volt generators and one 100-kw. 250-volt generator. The boiler house is equipped with four Stirling water-tube boilers of a total of 1400 hp., working under a steam pressure of 125 lb. The mine is worked on the four-entry system, all haulage being done by electric motors. It is ventilated by a Jeffrey fan, with an ultimate capacity of 200,000 cu.ft. per minute. This is now working at a capacity of 60,000 cu.ft. and a present speed of 30 r.p.m.

*Coke foreman, Wisconsin Steel Co., Benham, Ky.

As above stated, all the coke ovens in operation are of the beehive type. There are two parallel batteries, which contain 120 ovens each and one short battery of 60 ovens. The coal cokes exceedingly well, requiring little air, ¾-in. to 1-in. draft openings being used for 72-hr. coke and 1½-in. for 48-hr. coke. Six tons of coal are charged for 48-hr. and 7½ to 8 tons for 72-hr. coke.

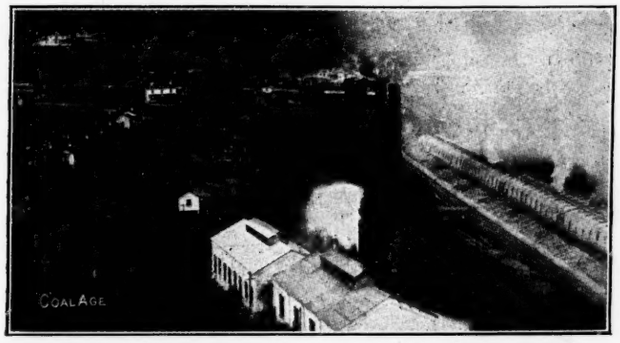


FIG. 2. BIRDSEYE VIEW OF BENHAM, SHOWING POWER PLANT AND COKE OVENS

The government test shows this coke to be among the best in the country. It has a light gray or silver color; the cell structure is small but not dense. It breaks in fingered pieces of fair size, which have a noticeable metallic ring. The 72-hr. charges make a high-grade foundry fuel. The per cent. of recovery is 63.5.

MUCH ATTENTION IS GIVEN SANITATION AND SAFETY

The town of Benham is laid off in streets and blocks, having the appearance of a well planned village rather than that of a mining camp. The houses vary in style and color, and all have hydrants in the back yards, the water supply coming from a reservoir, which is fed by mountain springs. This arrangement gives clean, wholesome water for domestic use, a separate system being provided for the power house and coke yard. The houses are

FIG. 3. BENHAM FIRST-AID TEAM AT PRACTICE

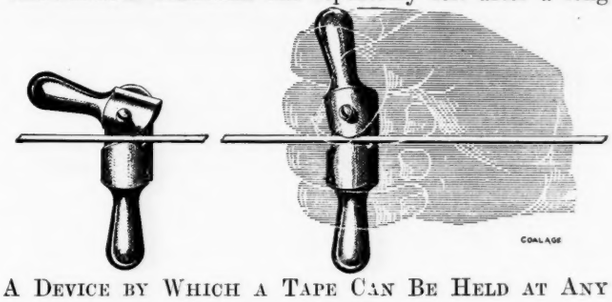
fenced and ample space is given for chicken yards and vegetable gardens at the back. Those desiring them are furnished with electric lights at a cost of 25c. per room per month.

Safety committees, made up of three men on each entry in the mine and in the different departments outside the mine, have been appointed. Each member wears a badge and it is his duty to observe closely and report any practice conflicting with the rules governing the operation of the mine or violating the mining laws of the state.

At the mouth of the main entry of the mine is printed in large letters, "Safety First." It will be easily perceived from the above that the company is sparing no effort to protect the lives and health of its employees. W. C. Tucker, superintendent, has given particular attention to the comfort and welfare of his men and to the sanitary condition of their surroundings.

A Tape Grip

The device illustrated below is a tape grip, and its purpose is to enable a chainman to obtain a firm hold at any desired point of the measuring line. In plumbing down a steep hill, using broken distances, it is not possible to make use of the hold furnished by the handles provided, but with the aid of this device, the tape can be stretched as tightly as if the whole line were being used. That soreness around the thumb and finger nails, which every conscientious chainman has repeatedly felt after a long



A DEVICE BY WHICH A TAPE CAN BE HELD AT ANY POINT ON ITS LENGTH

day's work, will be entirely removed by the use of this handy device, which he can slip in his pocket whenever it is not needed. The makers of the grip are Eugene Dietzgen Co., of 218 East Twenty-third St., New York City.

Increased Coal Output in Georgia

In 1912, for the first time in five years, the coal production of Georgia showed an increase over the preceding year, says E. W. Parker, of the United States Geological Survey. The production was 227,503 short tons, valued at $838,426. The decreased production in the last few years has been attributed to the withdrawal by the state of the convicts with which the mines had been operated.

The production in 1912 exceeded that of 1911 by 62,293 tons, or 37.7 per cent.; while the value increased $92,218. More than 50 per cent. of the increased production in 1912 was in the quantity of coal made into coke. This item amounting to 111,923 tons in 1912, against 72,677 tons in 1911, or a gain of 39,246 tons.

The total area of the coal field in Georgia is estimated at 157 sq.mi., this being the smallest coal area in the Appalachian states and not all of it workable. All of the production in 1912 was by two companies operating in Walker County.

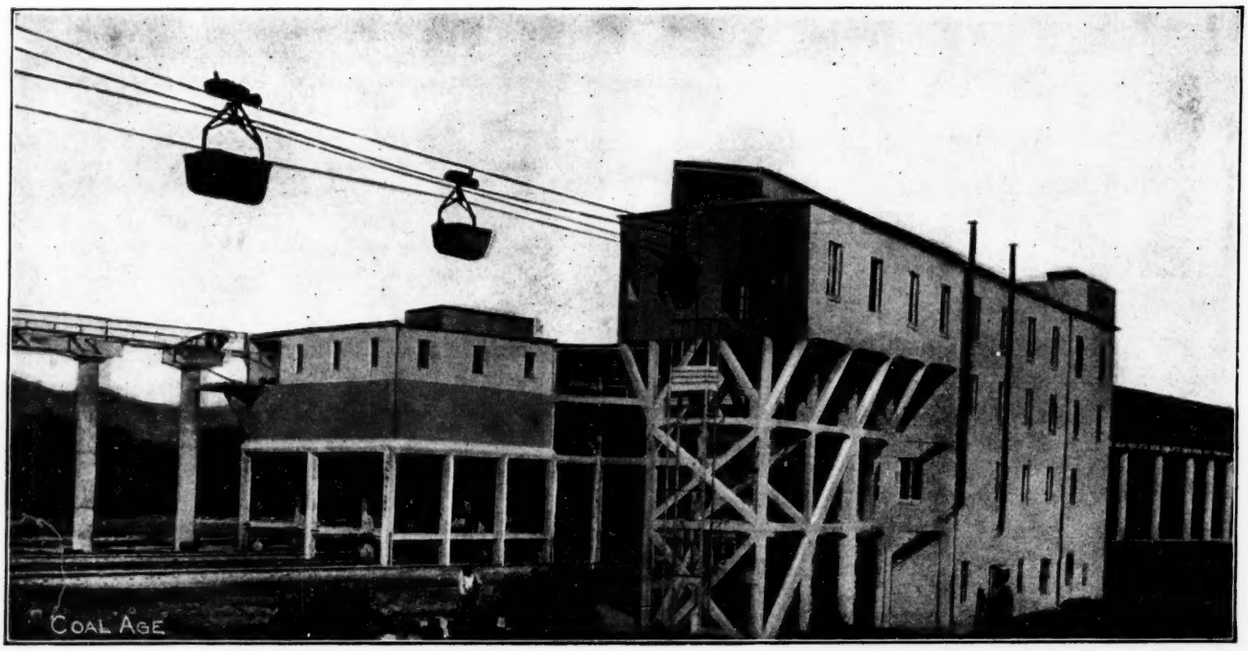
On account of its high percentage of fixed carbon (80) and its low sulphur content, the Lookout Mountain coal of Walker County gives a large product of excellent coke, which is sold to the furnaces of Chattanooga and other points in Tennessee and Georgia.

An Italian Aërial Tramway

By Our Berlin Correspondent

SYNOPSIS—A description of an aërial tramway which was installed to transport coal over rugged country from the harbor of Savona to the town of San Giuseppe, supplementing the facilities of a single-track railway, upon which the towns of northern Italy were dependent for their supply of coal and which could not be duplicated on account of the expense of construction.

The industries of northern Italy mainly depend for their supply of coal on the two harbors of Genoa and Savona, which, though near together, are separated by a precipitous spur of the Apennines which until a short time ago made any intercommunication impossible. Since Savona has only a single-track railroad to the interior, there were frequent disturbances in the coal supply, affecting the industry of Milan, Turin, etc. At times more than 30 coal barges would lie in the harbor unable to discharge their cargo. An improvement of this state of affairs was prevented by the expense which the installation of a second railway line, and the reconstruction of the quays of Savona would have entailed.



The San Giuseppe Unloading Station, Showing the Concrete Construction

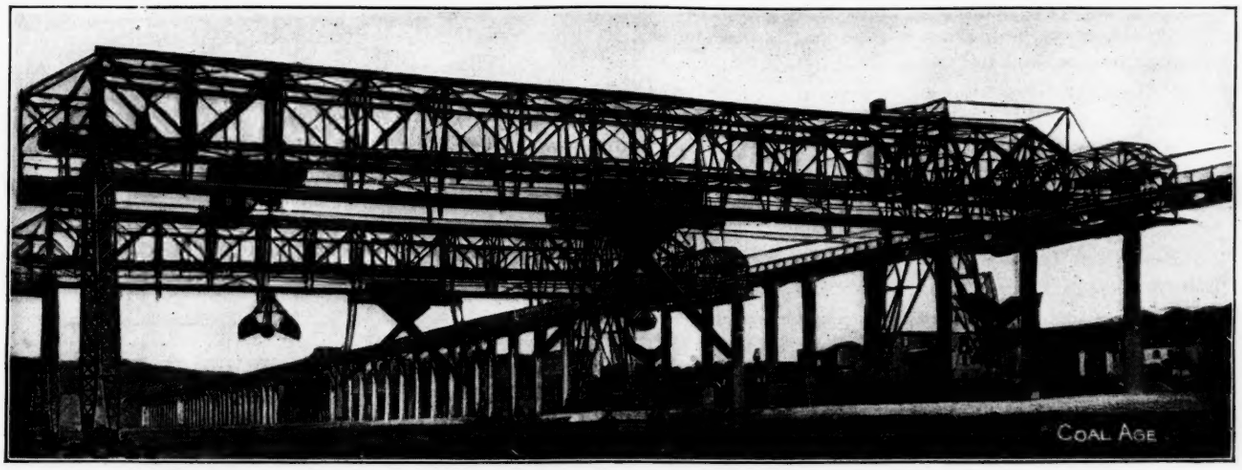
An Aërial Tramway 11 Miles Long

In order to avoid this expense, two Italian engineers, Carrissimo and Crotti, drew up plans for an aërial tramway to attain the same end. This plan required only small pocket installations at the terminal of the railway to act as buffers between the supply from the vessels and the actual demand. The terminal point of the ropeway was to be the railway station of San Giuseppe, which is 10.9 miles from Savona on the Lombardy slope of the Apennines and where there are railway connections with Turin and Milan. The scheme required the transportation of 900,000 to 1,200,000 tons per annum, which was found to be readily obtainable by means of a Pohlig aërial tramway. Therefore, Messrs. J. Pohlig, Ltd., with whom the scheme had been worked out, were entrusted with the installation, and the following plan was adopted:

Lighters were designed for receiving buckets of 30 tons capacity. These buckets, which empty at the bottom, are lifted by gantry cranes and unloaded into pockets which serve as the loading station for the aërial tramway to which they are immediately connected. The rope railway, 10.9 miles in length, terminates at San Giuseppe in a telpher line about 2950 ft. long where it passes over pockets and open store yards. The coal from the pockets is loaded into railway cars through chutes, but on the open store yards, loading bridges and crabs with automatic grabs had to be provided.

The Plant at Savona Harbor

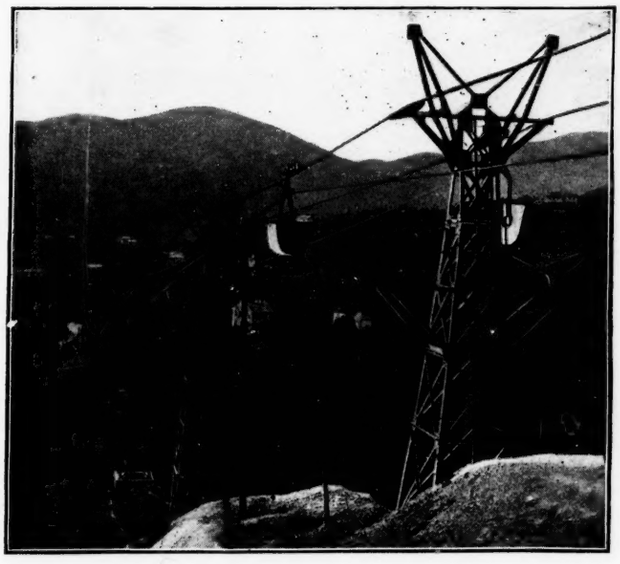
The whole plant consists of three main parts: First, lighters, cranes and pockets in Savona Harbor to unload the coal; secondly, the Savona, San Giuseppe aërial tramway; and, thirdly, a storing and unloading plant at San Giuseppe. In order to take up a minimum of the available space on the sea coast, the pockets in Savona Harbor were built out over the water as far as possible. They are made of reinforced concrete throughout and rest on concrete foundations. Each of the 24 pockets is 23x26.24 ft. in cross-section and 29.5 ft. in height, exclusive of the discharging funnel. Each compartment has a capacity of 17,650 cu.ft., corresponding to 400 tons of coal. Above these pockets, 59 ft. above the level of the water, there are three traveling gantry cranes, which can advance over the water on a projecting structure carried by pillars in order to pick up the buckets from the lighters.



VIEW OF TWO UNLOADING BRIDGES AND STORAGE YARD

A BUCKET WITH THREE LIFTING GEARS

Each crane has a main and two auxiliary lifting gears operated from a common lifting motor. The bucket is of the clam-shell type with two parts hinged near the top. From the main lifting gear there is suspended a transversal beam which when lowered causes the bucket to open. Transversal pieces suspended from the two auxiliary lifting gears, support the outside edges of the bucket. When raising coal, the three lifting gears are coupled together and thus operate jointly; in unloading, the two auxiliary lifting gears are kept in position while the main gear is lowered, causing the bucket to open.



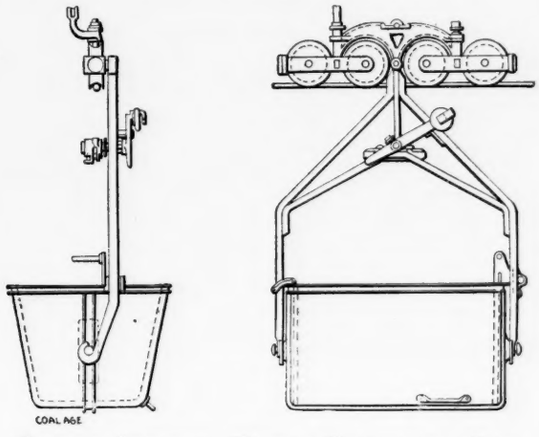
A GENERAL VIEW OF THE LINE

The lifting motor of each crane develops 150 hp. and is designed to lift a loaded bucket 40 tons in weight at a speed of 39.4 ft. per min. It operates both the main and the auxiliary lifting gears. The crane travels at a speed of 164 ft. per min., the traversing motor developing 45 hp.; the crab is traversed by a 14-hp. motor at a speed of 82 ft. per min. Continuous current at 250 volts, reduced by a convertor from 22,000-volt three-phase current is used for operating the crane, a storage battery balancing any heavy fluctuations in current consumption.

The lighters transporting the filled buckets are built of iron throughout and are provided with double gearing fore and aft, being operated by a 10-hp. electric motor, fed from a small accumulator battery which is recharged during the time the lighters are being unloaded in front of the pockets.

A LONG ROPEWAY WITH TWO LARGE TURNS

The loading station of the aërial tramway immediately adjoins the pocket. The suspended ropeway is 57,000 ft. in length and comprises five sections with intermediary stations at the points of connection. Section 1, which is 16,080 ft. in length, goes from the terminal station of San Giuseppe as far as Sella, and reaches at a distance of 2.4 miles the greatest altitude of the line, which is 1705 ft. The ropeway then continues in a straight line as far as Caribona, a distance of 9975 ft., and from there goes to Ciatti, 18,050 ft. At Ciatti section 3 joins section 4, which is 9300 ft. long, the ropeway at this station making an angle of about 111 deg. At Lorenzo station there is another point of deflection, the last section, 3700 ft. in length, between San Lorenzo and Savona being connected at an angle of about 105 degrees.



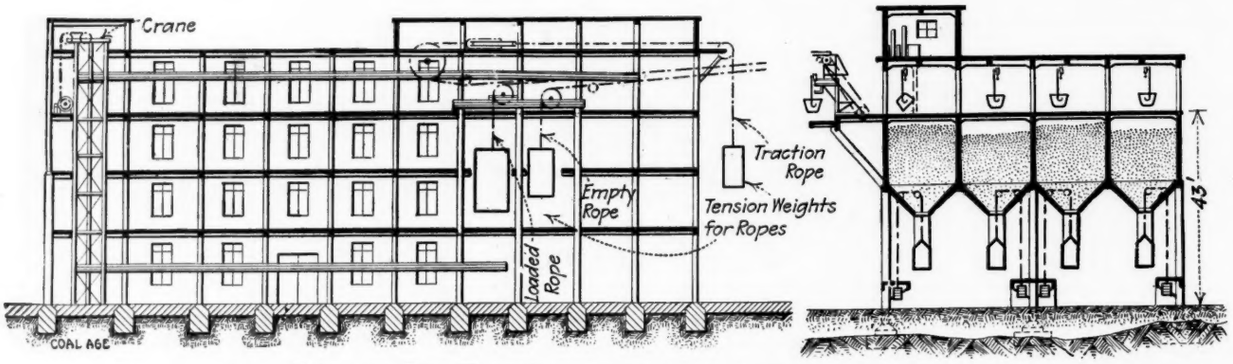
BUCKET SHOWING POHLIG TRAVERSING GEAR

The track of this aërial tramway consists of locked steel cables, the load cable being 2 in. and the no-load cable 1.38 in. in diameter, with a breaking strength of 135,000 lb. per sq.in. The cables are carried by 208 iron

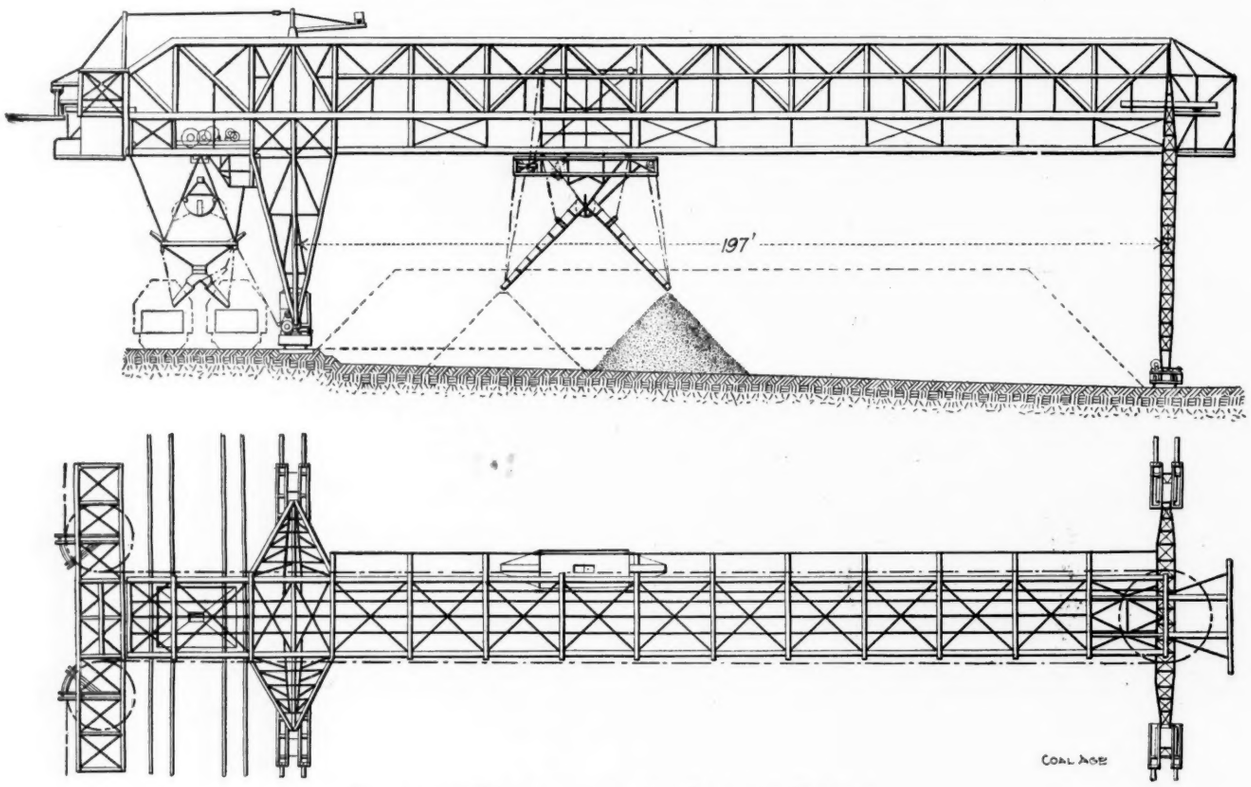
framework supports, the maximum span between two supports being 1068 ft., and the maximum height of supports 152 ft. The supporting cable is subdivided into sections of an average length of 4920 ft., which are substantially moored at one end, being kept taut at the other end by a weight. The traction cable is one inch in diameter and consists of steel wire of a breaking strength of 255,000 lb. per sq.in., and 1.58 lb. per ft. in weight.

the other buildings, is made of reinforced concrete. It is carried by hollow pillars 4.6 ft. in diameter, and about 52.5 ft. in height, which are placed at distances of 328 ft., at which point an interruption is made in the bridge to allow for temperature expansion. The two tracks for going and coming on the bridge are parallel to one another and are situated 13 ft. apart.

The aërial tramway buckets are driven on the elevated



SIDE AND END ELEVATION OF THE SAN GIUSEPPE STATION



PLAN AND ELEVATION OF THE LOADING BRIDGES

Each driving station is equipped with two 180-kw., 3-phase-current motors, one of which serves as a standby. The working tension of 500 volts is obtained by transforming the 22,000-volt current supplied to the railway.

THE TELPHER PLANT AT SAN GIUSEPPE

At the terminal station the aërial tramway is connected immediately to an extensive telpher plant, the tracks of which are installed partly above the pockets, and partly on an elevated bridge 2955 ft. in length, which, like all

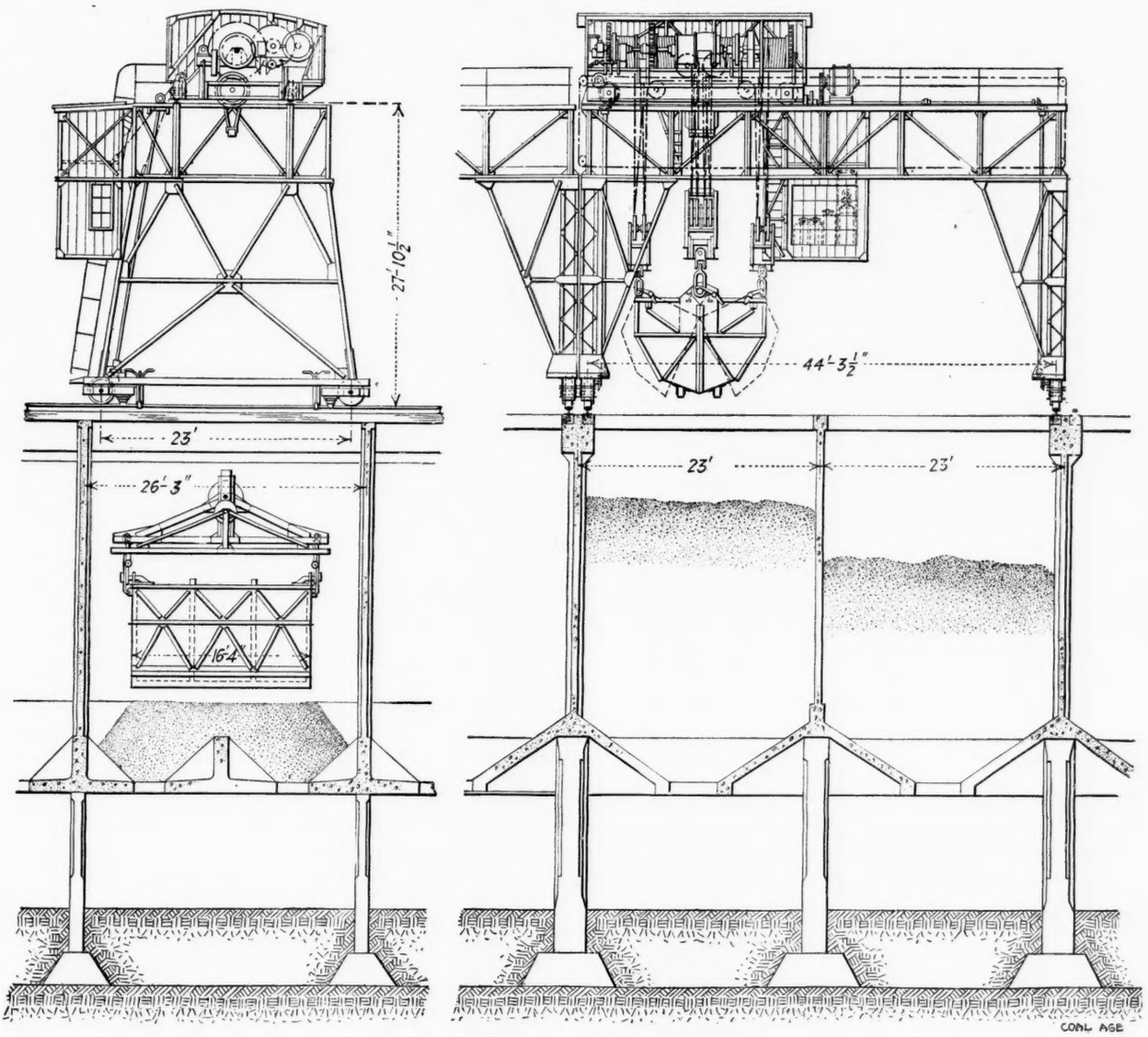
bridge by means of an endless cable arranged above the rails, the driving gear being situated near the center of the elevated bridge and operated by a 35-hp. motor. They are each designed for carrying 2200 to 2425 lb. of coal, and are about 3300 ft. in gross weight when fully loaded. As the ordinary two-wheel traveling gears could not be used to transport such high individual loads, and the adoption of twin traveling gears would have given rise to many drawbacks, a special type of four-wheel traveling gear was adopted, which has given satisfactory results in

connection with a number of heavy wire-rope tramways. The distinctive feature of the traveling gear is the design of the connecting beam above the traveling rollers. It has a hollow cast-steel body with an elliptical cross-section and possesses an extremely high resistance to torsion.

System of Unloading

The loaded cars arriving at the unloading stations are uncoupled automatically from the traction cables. They are then moved by hand onto the telpher tracks above the pockets and there unloaded. Whenever the coal is to be unloaded on the storage yard, the cars are moved by hand to the coupling station on the elevated bridge, where they are automatically coupled to the cables. The cars then travel along the cables on the elevated bridge, passing onto one or another of the traveling unloading bridges in order there to be unloaded automatically. These are each 197 ft. in span, and have runways 279 ft. in length.

While the support turned toward the elevated bridge is an ordinary pillar, the other has been designed as a gantry, each foot of the former resting on four pairs of wheels traveling on a standard-gage double track and operated by a 50-hp. motor. Each of the two feet of the gantry pillar has a traversing gear with two pairs of traveling wheels which run likewise on a standard-gage track, being operated by a 25-hp. motor. The two supports thus have self-contained drives, the steering and balancing of any speed difference being effected from the driver's stand, which is fitted into the stationary support.



Gantry Cranes and Dropping Buckets over Concrete Pockets

The Three Runways

The traveling speed of the bridge is 49 ft. per min. There are three runways on the bridge: First, the crab runway, which is suspended by means of brackets from the lower flange. Second, that carrying the wire rope resting on lateral projections of the lower flange. Third, the runway of the hoppers into which the cableway cars are unloaded. These hoppers, which are traversed at a speed of 79 ft. per min. by a special 8-hp. gear, have two chutes about 20 ft. in length, the lower half of which can be folded up. The crab comprises a 23-hp. traversing

motor and a 93-hp. lifting motor, the traveling speed being 591 ft., and the lifting speed 164 ft. per minute.

It is expected eventually to extend each of the two loading bridges by an additional bridge 187 ft. in length. The pockets at San Giuseppe have 48 compartments, 16½ x16½ ft. in cross-section and 16½ ft. in height. Each of these compartments has a capacity of 100 tons, and the whole plant a capacity of 4800 tons of coal. The store yard is 646,000 sq.ft. in area and has been designed to receive 300,000 tons of coal.

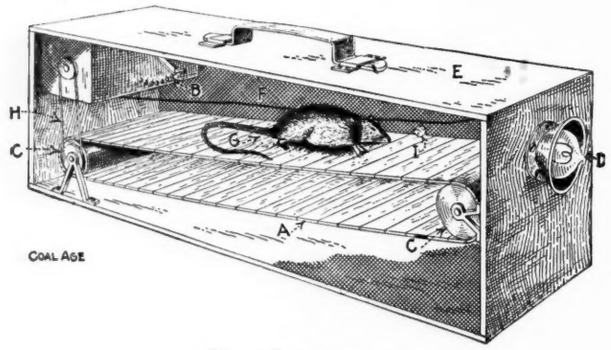
The whole plant as now completed is able to transport 900,000 to 1,200,000 tons of coal. As the need occurs, which is likely to be soon, this is to be extended by the addition of another aërial tramway of equal dimensions parallel to the former, and with duplicate pockets and loading devices at Savona Harbor, thus raising the transportation capacity to twice the present figure.

I am indebted to the *Zeitschrift des Vereines deutscher Ingenieure* for permission to publish the line drawings which accompany this article.

A Suggestion in Mine Safety Lamps

A contributor with a somewhat inventive turn of mind, and possessed of a desire to accomplish the dual purpose of detecting dangerous gas, and at the same time illuminating the gloomy corridors and passages of the mine, has sent us the accompanying drawing.

This device is simple, and requires but slight explanation. *A* is the apron of a tread mill, carried upon the ball-bearing rollers *C*. *B* is a gas-tight box containing a small electric generator, which is driven from the tread mill tail roller by means of the belt *H*. The terminals of the dynamo are connected through suitable cables to the electric bulb *D*, inclosed in an efficient reflector. The sides of the box, as may be seen in the drawing, are composed of wire netting *M*, which allows a free and practically unobstructed circulation of the mine atmosphere.



THE SUGGESTION

The motive power is furnished by a nimble and sinewy mine rat, which, for best results, should weigh approximately 3 lb., and stand about one hand, or less, high at the withers. As an incentive for vigorous and long continued action, a small piece of fragrant cheese may be suspended in the manner shown at *I*.

It is well known that all animals are easily susceptible to the action of mine gases, and the presence of the latter could therefore be easily detected from the behavior of the rat, thus dispensing with the necessity of carrying an innocent and attractive song bird to a hideous death. Furthermore, all animals work best when in their natural environment. In the dark and cavernous mines the rat, above all other creatures, should be strictly at home, and, with such an irresistible attraction before his nose as we have above named, he should be capable of proceeding at top speed (say 15 to 17 knots per hour) for as long a time as the oxygen will last in the helmet cartridges, or while the fireboss is making his noctural peregrination. Such a speed will make the dynamo fairly "hump itself," and send a clear penetrating beam of light far ahead.

As soon as the gas inspection is finished, or the helmet man returns to his base of supplies, the faithful animal upon the tread mill may be gently removed, carefully curried and rubbed down, given food and water, and allowed to sleep and recuperate until the next shift.

It is claimed that many advantages are to be gained from the employment of this ingenious, gas-detecting light-giving device. The supply of motive power is always abundant and cheap around coal mines, so much so, in fact, that it may be rightfully considered as a by-product. The expense of feeding an adequate number of rats while in captivity is small, since to keep them in good running condition they should not be allowed to acquire superfluous flesh, as this renders them phlegmatic and short-winded. Their care would require the services of a trained veterinary as such hardy animals thrive naturally when only sufficiently fed and properly exercised. The cost of their capture in most cases is merely nominal, amounting only to keeping an efficient wire trap baited with a few kernels of corn or other suitable lure.

L'ENVOI

"A little nonsense now and then
Is relished e'en by mining men."

[When this picture of the rat in his little box was shown to an inventive friend and the operation of this wonderful apparatus had been described to him, the dream light came into his eyes, and sitting down he composed the following lyric, in broad daylight and without the use of any subtle stimulants.—EDITOR.]

Here a little rat you see,
Held in dread captivity,
Chasing after toasted cheese
Instead of catching hungry fleas,
Doing at last some useful work,
Proving to all he is no shirk.

The rat, we almost all suppose,
In place of what we here disclose,
To be a dirty, lousy beast
Inclined upon our lunch to feast,
Tipping over our dinner cans
With scientific ratty plans.

But now he's found a job at last
And on a tread mill running fast,
He works away with all his might
To turn the wheels that give us light,
Until the time—alas!—alas!
He's overcome by deadly gas!

Say, who the —— was the —— fool cuss
Who invented this marvelous appa-rat-us.

EDITORIALS

Colliery Boiler Plants

An editorial appearing in the June 17 issue of *Power* entitled "Colliery Boiler Plants," calls attention to the lax and wasteful methods and practices prevailing in many, if not most, of such installations. The article says in part:

> Many such installations are very dirty with coal strewn thickly over the floor and ashpits nearly full of ashes. When the ashpit is cleaned out, but scant attempt is made to prevent mixing good coal with the ashes and throwing all out together. Then, again, neglect is indicated by the cracked condition of the boiler settings, especially where return-tubular boilers are used, and by badly cracked furnace fronts and warped firedoors. Many of the latter are so out of shape that it is impossible to shut them tightly.
>
> Leakage of air through the cracked boiler setting into the combustion chamber and an excessive amount of air leakage past the furnace doors above the fire produces but one result, improper combustion.
>
> If the exteriors of the boilers show neglect, it is natural to assume that the interiors are no better, and, if so, many of them are evidently operating under dangerous conditions. The few colliery plants operating without this neglect of economy and safety, for some are kept clean and orderly, by contrast, reflect the greater discredit on the rest.
>
> Reasons for this state of affairs are cheap coal, indifference, ignorance and lack of opportunity. The first three probably have much more to do with the effect than the last named.
>
> None of these reasons is sufficient to excuse the situation. Even if the coal is cheap, it is worth as much in the plant coal bin as on a car ready for shipment. If a ton of coal is worth a dollar when ready for the market it is worth a dollar in the boiler room. Every ton of coal needlessly consumed in the boiler furnace is a dollar thrown away.
>
> An increase in the selling price of coal is maintained by the mine operators as justifiable, because of the increased cost of production, but has any attention been given to the economical operation of the power plant which produces the steam and power necessary as an element in economical production? We believe not in a large number of installations.
>
> Is not the boiler plant left in the hands of men who are coal handlers rather than men capable of keeping the boilers in proper condition? Although neglect plays an important part in the conditions existing in so many of these mine plants it would appear that ignorance regarding boiler economy and safe operation is largely responsible.

In a large measure we are inclined to agree with rather than dissent from the views of our contemporary. The conditions existing in many colliery plants are highly reprehensible and deserving of such bitter condemnation as is given above. On the other hand, there exist in many instances, circumstances which may strongly mitigate an apparent evil.

At many mines, particularly in the bituminous region where coal is sized for the market, it is only the poorest and least valuable of fuel that finds its way to the boiler furnaces. In many such plants, the best grade of slack that it is possible to secure will bring a price which is far below the cost of production. Frequently, also, the material removed from the coal in the picking process contains a considerable amount of combustible matter, and this refuse, which would otherwise have to be disposed of at an appreciable cost, is burned under the boilers.

While there is no possible excuse for dangerous methods of procedure in boiler practice, or for slovenliness in plant operation, regardless of the quality of fuel burned, yet we would call attention to the fact that good engineering in the operation of a plant upon coal costing $1 per ton may be decidedly different from the economical operation of the same plant on a fuel which costs only 25 or 30c. per ton. This practice would again vary upon the use of mine refuse, for which no legitimate charge in dollars and cents could be made.

In such a case, it may be quite true that care and forethought, together with a small investment in cash, may effect a saving of one-half in the amount of fuel burned. Considering the monetary value of the conserved material, however, we might well ask, in the language of Petroleum V. Nasby, "how much is twice nuthing?"

❋

The Evolution of the Mine Foreman

There is some truth in the statement made by a Pennsylvania Engineer, in the preceding issue, that the mine foreman has been a victim of two opposing duties.

The belief is commonly expressed, whether it be true or false, that the cause of the inefficiency of our laws is to be found in the fact that those who enforce them are "openly and notoriously" in the pay and financial or moral control of those against whom the enforcement must proceed. "Open and notorious" indeed is the control of the mine foreman, when that control is embodied in the state statute, when all pay, emoluments, duration of service, reputation, everything in short, are dependent on one of the parties, which he is required to keep amenable to those statutes. It is as if a federal law provided that each distillery hire a gager, who shall determine the taxes upon the product of the still, or each abbatoir shall engage enough inspectors and bacteriologists to protect the public against diseased meats, said gagers, inspectors and bacteriologists to be answerable for all the acts of their employers, yet to look to them for every tittle of compensation on which they and their families depend.

The existing enactments resemble a contract so written that the contractor is bound to provide a "qualified" inspector of the work thereby contracted, is to select and to pay him with privilege to remove him at his pleasure, without reason given, is permitted to give him enough other duties to keep him continuously employed and yet provides that the decision of the said inspector or his underlings is binding should any question arise as to compliance with the specifications. But there is yet another provision that every six months or so, a real, independent inspector shall spend a day or half day on the job ordering a correction of all those defects which the *ex-parte* inspector has been unable to cover up for his employer.

In these facts are to be found an important justification of the acts about to be passed or already in force making the operator liable for accidents to the employee. The monetary interest of the operator is then centered in the safety of the men he employs and the foreman knows he is as much liable to the employer for loss of life as for waste of material or high cost of coal.

In all branches of human activity are sordid and reckless persons, and legislation which will make them pay the costs of their penuriousness and of their gambles with death is usually in the interest of humanity. There are also careless and foolish workmen. It has been hard to control such men hitherto, but it is likely that when the operator has to compensate the families of such men in case of death, men with dependents will find it hard to get employment anywhere unless they subject themselves to such reasonable discipline as will assure their safety. It is unfortunate that the laws have been so weak that the disciplining can only be effectual when the operator, who has normally nothing at stake, is compelled with some measure of injustice to restrain the wilful workman from his own destruction.

The operators who have been making money have been disposed to compel the foremen and their workingmen, when compulsion was necessary, to comply with the law, but some of those who were hardly able to make a profit have been disposed to content themselves with doing only what the inspector demanded.

Perhaps it may be necessary under a liability law to appoint a safety inspector in every mine, and it may yet come about that he will be appointed like boiler and elevator inspectors by the company which assumes the operator's risk, only his work will be continuously at one mine and not an unending travel from operation to operation. His mind will be as keenly on the liability per ton produced as the foreman's is on cost per ton and output per running day.

The West Virginia Investigation

The majority of people in this country would like to know the real truth concerning the labor situation on Paint and Cabin Creeks in West Virginia. The interest extends to the whole mass of people and is not confined to those engaged in mining, though their interest is probably greater. That disinterested citizens can and will judge fairly concerning any question, when the truth is laid before them, is demonstrated every day by the jury system used as a basis in our trial of causes. It is hard to know what the true facts are in West Virginia.

Everyone is aware that there is trouble at the mines, that a controversy is being carried on between those who own the mines and those who work in them. Some facts concerning it seem to be well established, as they are often repeated without denial. It is true that men have been employed to guard the mines and that there have been fights between them and others, so that it has been considered necessary to declare martial law throughout a certain region. It is true, also, that men have refused to work and that some mines have been idle. Statements have been issued that no strike was in progress and then a contradiction has been made. Yet all the signs of a strike and its accompanying trouble exist. From all the mass of contradictory statements it is hard to find out what is and what is not so.

It was to be hoped that the investigation by the Senate committee would disclose the true situation, but confidence that it will do so is destroyed, when the investigators do not conduct themselves in the manner of impartial judges. It is rather shocking to read in the papers that one member of the investigating committee made a speech in church on a recent Sunday in which he used flowery language concerning the fair state of West Virginia, and then boldly stated that some of its citizens had been consumed by greed. When it is realized that this same man, as a member of the committee, had listened only to the testimony of one side, it is hard to believe the mine owners will get a square deal. At a later date it is reported that the same senator used abusive language toward a man appearing before the committee.

This is not the attitude of a judge quietly seeking justice for all the people, but that of a politician to whom his colleagues have granted the favor of a place on an investigating committee, that he may have the opportunity to gain publicity so as to promote his political future.

It is doubtful if any real good can come from an inquiry conducted in such a spirit. An investigation of another sort, however, might be able to bring about an adjustment of relations between owners and miners which would result in lasting peace and prosperity.

The Operators' Attitude toward Legislation

The addresses and articles delivered by operators before institutes and contributed to the technical press are an answer to the statement that the mine owner manifests no interest in safety. Representatives of capital serve on committees to formulate new mining laws and the measures they aid to draft completely refute the assertions of those who would represent them as callous to the needs of the mine worker.

We are convinced that there are many operators who are anxious to make their mines as safe as they can be made. They will not be content simply with having their men live longer than the average man, but desire that no employee shall suffer by reason of any oversight or omitted precaution of which they may be guilty.

But as long as the law does not compel sufficient safety on all, as long as one state is more careless than another, so long the operator who would make his mines the last word in security will hesitate to expend the money which now shields him from bankruptcy.

Many a man, able to see a balance in normal years, only by closing his eyes to the value of his coal in the hill and to the depreciation of his plant, is fain to go not a step beyond the law's imperative demands till his neighbors are compelled by a new enactment to make like improvements.

This is one reason why the anthracite corporations and the subsidiaries of the several steel companies, have been more active than other bodies. Those organizations could see a balance at the end of the year's expenditures and they have unstintedly spent money which the law did not demand, for the comfort and happiness of their employees. Sometimes we wonder whether a stockholder, filled with the narrowness which only too often distinguishes those who seek to enforce the law against corporations, might not bring suit against these beneficent organizations for following the dictates of the company soul rather than the undoubted law of the land, which requires that the corporation shall conduct its business to the best interests of those who have intrusted it with their money, subject only to the law's restrictions.

SOCIOLOGICAL DEPARTMENT

Is the First-Aid Situation Muddled?

By Daniel J. Boyle*

I read the remarks entitled "The First-Aid Muddle" in your issue of May 17 with some concern. The physician who wrote this article deplores the attempt of the promoters of first aid, in this country, to perfect and promote first aid among workers in hazardous occupations.

My experience in first-aid work leads me to believe that there cannot be a definite system of treatment which will apply to all conditions. Even the St. John Ambulance Corps does not specify any individual preference for any special form of artificial respiration or of applying bandages. Moreover, it does not advocate any special appliance for use in treating injured persons. Different conditions demand varying methods of treatment.

There is an essential difference between the conditions on the field in which a meet is held from those which obtain in a mine, for the rescuemen underground do not have all kinds of antiseptic bandages and suitable appliances with which to perform their work.

It is possible that the first-aid man will have to use, in the actual conditions which confront him, part of his own clothing, pieces of lagging or bark, to bind and hold respectively a simple, a compound or even comminuted fracture.

Moreover in the case of artificial respiration, it must be remembered that the victim may be injured in several parts of the body and his ribs may be broken, or he may also be seriously burned about the chest or arms. If this is the case, he could not be treated by the Sylvester, Schafer, or Lathrop method. In fact, no form of artificial respiration could be used which would require that the operator should touch the burned or broken parts of the arms, chest or abdomen. For an injury such as that described, Laborde's method of artificial respiration, or some like method, would have to be practiced. I believe that any of these methods are good when you can use them, and that due credit to their value should be accorded by physicians and by the men whom they train. They should all be taught to first-aid men.

The first thing which rescuemen should learn is how to stop bleeding, for in case of an accident which severs a blood vessel or in any way produces a marked effusion of blood the injured man must be treated for this injury whether he is conscious or not. After the bleeding has been stopped respiration should be restored.

The physician's remarks that too much stress was placed on aseptic treatment of wounds in according the demerits at a meet are, it seems to me, unfair. No lesson can be more important to the average first-aid man. Only a few years ago, when patients were bleeding, it was thought the proper treatment to take a cud of tobacco from the mouth and put it on the cut. The man who gave up his quid may have had a cankerous mouth, or may have been a sufferer from tuberculosis, but his chew of tobacco was a styptic and therefore was thought available for use.

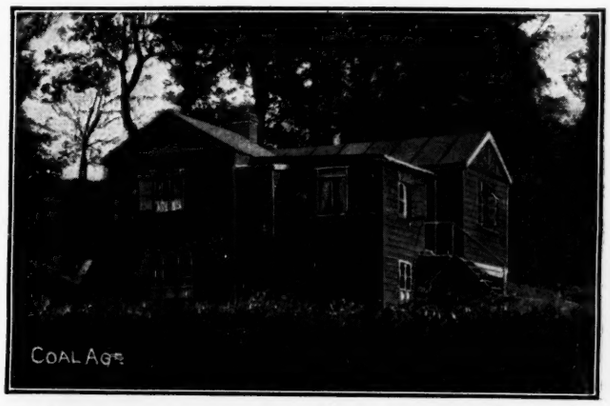
The Bureau of Mines, in calling a conference of first-aid workers at Pittsburgh, Penn., Sept. 25, 1912, and in forming the American Mine Safety Association, performed a valuable service to the mining community. I do not think that the principal results to be attained by such a conference, or by the formation of such an association, are to be found in the formulation of a series of standards for first-aid work. Its largest function is educational.

*Fern Glen, Penn.

A British House-Building Experiment

The house shown in the illustration was designed by J. M. Milner, vicar of Poundstock, Cornwall, England. The foundation walls are built by sections in what is termed a "pattern mould," and by employing, in part, modern patented materials, a six-room cottage of two stories can be erected for $650.

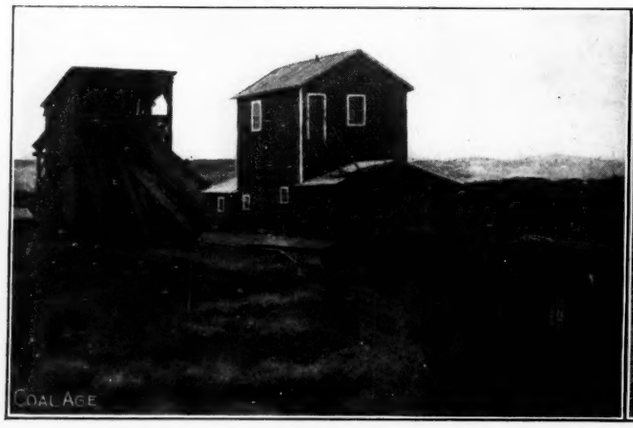
The kitchen or living room measures 15x12 ft. and the height is 9 ft. 6 in. except for 3 ft. on one side where a bacon rack is hung. The stove is of cast iron, having a boiler set in brickwork and furnished with a wide shelf ("hob"). The chimney is of brick. A cupboard is provided to serve as a larder. The scullery contains a sink with a tap from the rain-water tank, while in a recess is a Thompson seamless copper boiler, with the flue entering the kitchen chimney.



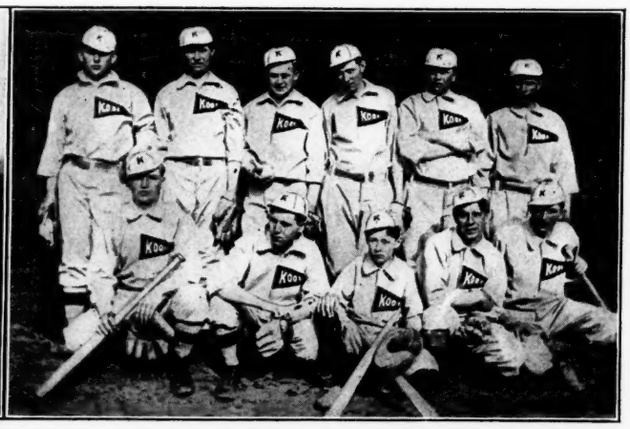
An English Experiment in Cheap Housing

The other rooms are a large bedroom, two smaller sleeping rooms, and a small parlor. The walls are of weather-boarding either over a thick vulcanized sheeting or asbestos-cement sheets $\frac{3}{16}$ in. thick nailed to 3x2-in. framing and lined with $\frac{3}{4}$-in. match-boarding. These walls are of good red fir and are rain-proof. They are quite stiff and it is claimed that they are dryer than those of a stone house, the woodwork below the vulcanite being better protected than it is in a building constructed of stone.

The Human Element in Coal Mining

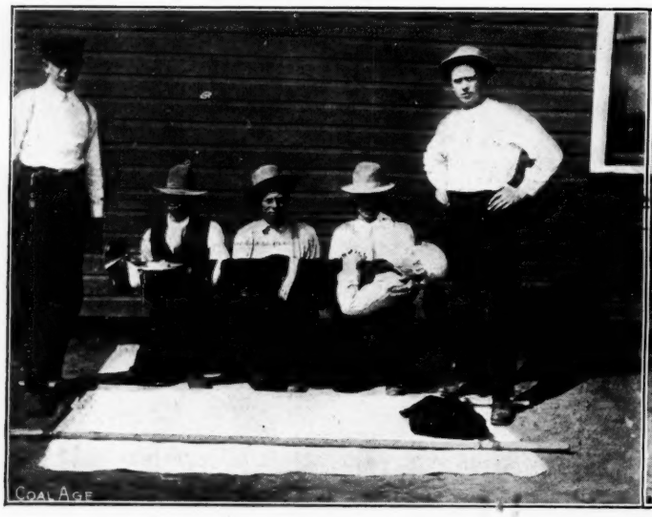


Car Haul and Tipple

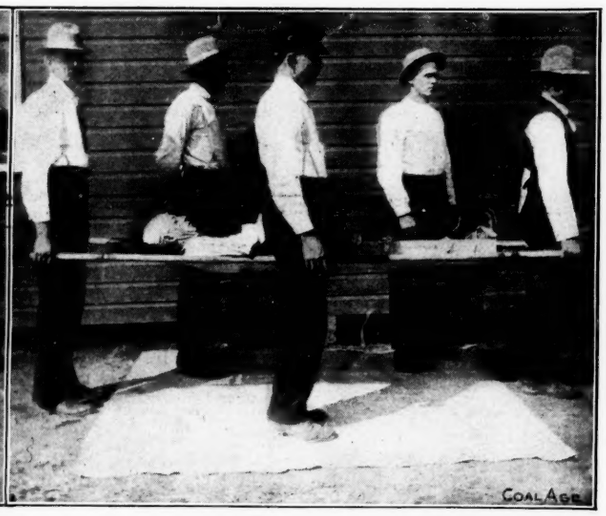


The Baseball Team and Its Mascot

THE KOOI PEOPLE AT WORK AND PLAY



Correct Manner of Placing on Stretcher



Squad About to Carry Patient Up-Hill

THE RESCUE TEAM AT KOOI. WYO.

The Victim Covered by a Fall of Rock

The Broken Leg and Arm Are Bandaged

FIRST-AID SQUAD OF VANDALIA COAL CO., INDIANAPOLIS, IND.

DISCUSSION BY READERS

Mixed Lights in Mining

Letter No. 1—It is an interesting fact that in mines where the workings are extensive, certain sections may generate gas in sufficient quantities to necessitate the use of safety lamps. If the ventilating currents, however, are kept separate, no trace of gas may ever be found in the other sections of the mine. Where such conditions exist, I believe it is entirely consistent with safety, if the ventilating system is properly planned, and the overcasts and stoppings are substantially constructed, to use open lights in the nongaseous sections.

Where this is done it is advisable to use an exhaust fan and great care must be exercised to keep open lights off of the return airway. The overcasts should be of concrete reinforced with discarded mine rails and made sufficiently strong to resist the force of a possible explosion. The gaseous section of the mine should, so far as possible, be isolated from the other workings, by means of barrier pillars; but where necessary connections have been made, the stoppings in such openings should be constructed of reinforced-concrete or stone, and should be built in pairs. Then, in case of the failure of one, the probabilities are that the force of the explosion will have spent itself to such a degree that the remaining stoppings will be able to resist being blown out.

I believe that the above method of isolating each section of the mine ventilated by a different current if introduced into every mine, would prove equally valuable in localizing the effect of a dust explosion.

ERNEST L. BAILEY, Mining Engineer.
Crumpler, W. Va.

Letter No. 2—The large majority of miners prefer to use an open light in place of a safety lamp, because it is more convenient and gives a better light, which enables them to perform more work in the same time. On this account, the miners and, too often, the mine officials are willing to assume a considerable risk in order to get out more coal, increase the output of the mine and keep down the operating expenses.

Most miners and many mine officials have never made a study of the formation and occurrence of natural gases in the strata overlying or underlying the seam of coal. They do not realize as they should that the working places and other parts of the mine that are at present free from gas may become gaseous, and that dangerous bodies of firedamp may accumulate, at any time, in such mines.

A study of the subject of mine gases makes it clear that it is practically impossible to determine, with any exactness, where gas may be expected in coal formations, or the exact location of pockets of gas, which occur frequently in the strata. Also, it is impossible to determine the amount of gas that may be given off in the mine workings.

After all that has been written in regard to mine explosions, it is quite clear that there is no means of determining, in advance, the strength and magnitude that an explosion of gas or dust in the mine may attain when such an explosion has once originated. For this reason, it is better practice to try and prevent the occurrence of an explosion by avoiding the ignition of gas or dust in the mine atmosphere. There are too many lives and too much property at stake to run any risk in this regard. In most cases, it will be found that the increased cost of operation, due to the use of safety lamps, will be offset by the increased protection afforded thereby, in the operation of the mine—protection against fire and explosion.

In my opinion, all mines where gas has been detected should be worked exclusively with safety lamps. When mines are worked with mixed lights, the miners are apt to think that open lights being used in one part of the mine, they can be used also in other portions. They become careless and often proceed to enter places where gas may exist, unconscious that they have an open light on their heads, until they are made aware of the fact by the ignition of the gas at the roof. Even with strict mine regulations, it is difficult to avoid such an occurrence where mixed lights are used.

I believe that the exclusive use of safety lamps throughout the mine where gas is generated in any part of the workings, has a tendency to make the miners more careful in regard to the gas, which they know exists in places. Safety lamps, also, offer a greater amount of protection, because they indicate more clearly the presence of dangerous gas in the mine atmosphere, and this warning permits the miner to retreat to a place of safety without igniting the gas.

BENJAMIN HARTILL.

Johnstown, Penn.

Shooting Mine Timber

The seam of coal we are working is known as the "Big Seam." A section of the seam is as follows:

Top coal	2 ft. 0 in.
Rock	0 ft. 8 in.
Coal	2 ft. 0 in.
Rock	1 ft. 8 in.
Coal	3 ft. 0 in.
Total	9 ft. 4 in.

The two lower seams of coal and the one of rock between them are worked out as the rooms are driven up, the remaining top coal and rock being left up until the room has reached its limit, when they are taken down as the pillars are drawn back, or in "retreating."

Gas is found to some extent in this mine, and the method employed here of shooting instead of drawing the timbers when retreating is calculated to cause trouble. Two sticks of permitted explosives are used in each timber, making an average of 12 lb. of powder exploded on the air.

The Sylvester machine, recently described in the article, "Recovery of Mine Timber," Apr. 5, p. 529, could undoubtedly be used to advantage in some of the rooms,

in this mine; but in other rooms it could not be put into practical use, owing to the waste being built up to within a foot of the roof.

If any reader has worked a similar seam, I would be glad to know the method he employed for drawing the timbers. MINER.

Littleton, Ala.

Effect of Safety Lamps on Eyesight

There appeared some time since, in COAL AGE (Vol. 2, p. 734), a brief comment on the use of the safety lamp as affecting the eyesight of miners. The article stated three objections to the use of the safety lamp; namely, the poor light given in comparison with other lamps; the shadow thrown by the lamp on the roof and floor; and the irritation to the nerves of the eye caused by the alternate light and shadow to which the eye was exposed by reason of the alternate upward and downward glance, in observing the roof and floor of the mine.

I have used safety lamps for the past 14 years; and, while it is true that a safety lamp does not give a light equal to that of an open lamp, the security afforded by its use, in a large measure, makes up for this deficiency. The shadow cast by the lamp on the roof and floor depends largely on the style of lamp used and the way in which it is carried. The safety lamp should always be carried in an erect position. The best style of safety lamps has three standards securing the chimney of the lamp to the oil vessel. The safety lamp used by firebosses should be provided with a shield encircling about two-thirds of the lamp gauze. This shield forms a suitable screen to the eyes and reflects the light forward, which greatly improves the illuminating power of the lamp.

Any practical fireboss can put a shield on his lamp if this is not provided. The shield consists of a piece of tin, or copper, of the same height as the lamp gauze and bent in the form of a semicircle, the two edges of the shield being turned so as to partly encircle two of the lamp standards. These shields are also supplied by manufacturers on request.

From my experience, I think I am safe in stating that my eyesight has not been injured, in any manner, by the use of the safety lamp. From observation, I would say that not 5 per cent. of the firebosses employed in mines would admit that their eyesight was at all affected in this manner. I believe there is greater danger, as far as the effect on the eyesight is concerned, in the use of the carbide lamp, and in the use of a poor grade of lamp oil, such as is often sold to miners. The carbide lamp produces a strong light that requires some effort of the eye to adjust itself to the difference between the light and dark in the mine.

JOHN SUTTON, Fireboss.

West Terre Haute, Ind.

Study Course in Coal Mining

BY J. T. BEARD

The Coal Age Pocket Book

Addition of Larger Numbers—When numbers of two or more figures are to be added together, proceed according to the following:

Rule—Write the numbers one under the other. Beginning on the right, place units under units, tens under tens, hundreds under hundreds, etc., etc. Add, first, the column of units, and place the units figure of this sum under the units column for the units figure of the required sum. Then carry the tens, or hundreds figures forward, writing them above their respective columns, to be added with the figures in those columns. Now, proceed to add, in turn, the tens, hundreds, etc., columns separately, including the figures carried forward from the preceding columns and written above these columns. As before, write the units figure of the sum of each column below the column added, for the corresponding figure of the required sum and carry the remaining figures forward, writing them over the next preceding columns, to be added in those columns. The full sum of the last column added, on the left, is written below for the corresponding figures of the required sum.

One or two examples will make the process clear.

1 231 22		1 122 23	
3,467,448	0	6,321,824	8
632,123	8	1,520,209	1
9,547,379	8	78,367	4
29,280	3	925,056	0
246,563	8	7,698	3
13,922,793	0	8,853,154	7

Proof by Throwing Out Nines—To prove the addition to be correct, the method of throwing out the nines is the simplest and best. It is as follows: Beginning with the top row of figures add the figures in that row, subtracting 9 whenever the sum equals or exceeds that amount. For example, taking the top row of figures, in the example on the left, and adding the figures from left to right, throwing out 9 as often as possible,

$$3 + 4 + 6 = 13| - 9 = 4| + 7 = 11| - 9 = 2| + 4 + 4 = 10| - 9 = 1| + 8 = 9| - 9 = 0$$

Again, for the second row,

$$6 + 3 = 9| - 9 = 0| + 2 + 1 + 2 + 3 = 8$$

The same process is repeated for each successive row of figures, including the final sum; and the result in each case is written in a separate column on the right. If the work is correct, the same process of adding the figures in this column and throwing out the 9's will give the same result as was obtained by applying this method to the final sum. For example, adding the column on the right, throwing out the 9's, and then doing the same in the final sum, we have

$$8 + 8 = 16| - 9 = 7| + 3 = 10| - 9 = 1| + 8 = 9| - 9 = 0$$
$$1 + 3 + 2 + 2 + 7 = 15| - 9 = 6| + 3 = 9| - 9 = 0$$

The Coal Age Pocket Book

In each of the above solutions, the bar is introduced to divide the several operations, as these do not represent a continuous equation. Also, the work is simplified very much by ignoring any 9's among the figures as was done in the last operation.

SUBTRACTION

Subtraction is the operation of finding how much greater one number is than another; or, in other words, finding the difference between two given numbers. The operation is the reverse of addition. The greater number is called the "minuend" and the lesser number the "subtrahend." The sign of subtraction (—) is called "minus," and when written between two numbers indicates the number following the sign is to be taken from that preceding. Thus, $8 - 5 = 3$ shows that five taken from eight leaves three, which is called the "difference" or the "remainder."

In subtracting a less figure from a greater, the difference can be found readily by counting the number of consecutive units necessary to reach the greater number. For example, to subtract 4 from 9, it is necessary to count five units beyond 4 to reach 9, as shown thus:

$$\overset{1\ 2\ 3\ 4\ 5}{1\ 2\ 3\ 4\ |\ 5\ 6\ 7\ 8\ 9}$$

The operation is expressed thus, $9 - 4 = 5$.

Subtraction of Larger Numbers—When numbers of two or more figures are to be subtracted, the one from the other, proceed according to the following:

Rule—Write the lesser number under the greater, placing units under units, tens under tens, etc. Beginning on the right, subtract the units figure in the subtrahend from that in the minuend and write the difference for the units figure of the remainder. It frequently happens that the figure in the subtrahend is greater than the corresponding figure in the minuend, in which case it is necessary to borrow one from the next figure on the left, writing the borrowed 1 as tens. Now, subtract the figure in the subtrahend from that in the minuend increased by ten and write the difference in the corresponding place in the remainder. When making the next subtraction, however, the figure in the minuend must be regarded as diminished by 1.

One or two examples will make the process clear.

1 1		11 11	
3,468,509	Minuend	1,630,001	Minuend
1,384,317	Subtrahend	29,999	Subtrahend
2,084,192	Remainder	1,600,002	Remainder

Proof by Addition—To prove the subtraction to be correct, add together the subtrahend and the remainder, and if the work is right the sum obtained will be the minuend.

	1 1		11 11
Proof	1,384,317	Proof	29,999
	2,084,192		1,600,002
	3,468,509		1,630,001

INQUIRIES OF GENERAL INTEREST

Working in Compressed Air

What are the effects of compressed air upon the human system when a man is following up that kind of work?

SUBSCRIBER.

Olyphant, Penn.

The effect on the human system due to working in compressed air for any given length of time varies with the health and physical condition of the individual. It has been found unsafe to allow anyone to enter an air chamber where the air is compressed to two or more atmospheres, without a previous medical examination. Even when this precaution has been taken, fatal results have ensued, the victim dying from what is known as caisson disease. At times, sudden death has resulted after the person has worked in compressed air for several months without being apparently affected thereby up to the time of his death.

The symptoms, in severe cases, are unconsciousness or paralysis, or both, accompanied by acute pain in the limbs. This was at first thought to be due to the compressed air being absorbed in the blood and tissues, and later liberated throughout the body when the pressure was relieved. The liberation of the compressed air from the blood and tissues was believed to be sufficiently violent to disrupt the tissues, froth the blood and interfere seriously with the circulation.

The continued study of the subject, both by doctors and engineers, revealed the fact, however, that the true source of the trouble could probably be ascribed to the saturation of the blood with nitrogen. It is true that aërated air contained in a bottle effervesces freely when the cork is drawn, owing to the escape of the air from the water. The effervescence is much more violent in the case of water saturated with carbon dioxide, owing to the greater solubility of this gas in water.

Dr. J. S. Haldane showed conclusively that the percentage of carbon dioxide absorbed varies inversely as the pressure on the air. For example, the percentage of carbon dioxide in the air exhaled from the lungs, under atmospheric pressure, is 5.6 per cent.; under two atmospheres, the carbon dioxide in the exhaled air is 2.8 per cent.; and, under three atmospheres, 1.86 per cent. In addition to this automatic regulation of the percentage of carbon dioxide, Dr. Haldane has said that, owing to the oxygen of the air being taken up chemically by the hemoglobin, the blood in the human system soon becomes poisoned with an excess of nitrogen, where the atmosphere is compressed.

In the practical application of this theory, the difficulty of respiration in compressed air has been, it is stated, wholly overcome by supplying a constant volume of *compressed* air per minute to the workers, instead of a constant volume of *free* air per minute. It was found that some parts of the body are affected more quickly than others; and experiment showed that 90 per cent. saturation took place in the slowest parts, in 4 hr.; while complete saturation took place, in the quickest parts, in 40 min. From this it was concluded that there was danger in removing too quickly from a compressed atmosphere, after an exposure of 40 min.

The period of time of withdrawing from a compressed atmosphere is called the period of "decompression." Observing that no serious results had occurred by rapid decompression up to about two atmospheres, Doctor Haldane concluded that no danger was to be anticipated by decompressing rapidly to the extent of one-half the absolute pressure; but, beyond this point, sufficient time must be given for complete decompression to allow desaturation of the blood to take place, depending on the time of immersion in the compressed atmosphere.

The disorders resulting from working in compressed air were seemingly removed when the person affected reentered the compressed atmosphere from which he had withdrawn. The most practicable method of avoiding the troubles arising from working in compressed air, it has been found, is to lengthen the period of withdrawing from the compressed atmosphere.

The same theory now advanced by Doctor Haldane was promulgated by one Paul Bert, about 1880. Mr. Bert then claimed that the effect on the human system was caused by the absorption of nitrogen in the blood; and he advocated withdrawing slowly from the compressed atmosphere, suggesting a period of 30 min., for compressions up to three atmospheres, and 60 min. for compressions up to four atmospheres.

In late practice, in tunnel work, two or three air locks are provided, and the men are required to spend a certain number of minutes in each lock, the time increasing as the pressure decreases in each successive air chamber. The greatest pressure under which men can work with safety may be stated as four atmospheres, although men have been exposed, for short periods, to pressures of six atmospheres, without experiencing any ill effects.

❖

Why Compressed Air Freezes

Kindly explain why compressed air freezes.

INQUIRER.

Kingston, Penn.

Compressed air does not freeze, but the moisture it contains is deposited as frost when the air is allowed to expand by escaping into the atmosphere. This expansion is accompanied by an absorption of heat from the surrounding air, the absorbed heat becoming latent in the air. As a consequence, the temperature of the surrounding air falls sufficiently to freeze any moisture that may be present. The capacity of air for holding moisture decreases with the fall of temperature, and the moisture appears as a vapor, which is frozen immediately, if the temperature is sufficiently low.

This effect is often observed at the exhaust ports of the air cylinder of a pump operated by compressed air. It frequently happens that when the pump is driven by compressed air, the freezing of the moisture completely closes the exhaust ports of the air cylinder.

EXAMINATION QUESTIONS

Miscellaneous Questions

(*Answered by Request*)

Ques.—A mine ventilated by three splits of air showed the following distribution of current: Split A, 2500 cu.ft.; split B, 1500 cu.ft.; split C, 2000 cu.ft.; making a total of 6000 cu.ft. per min. What quantity of air will pass in each of these splits if the total quantity is increased to 75,000 cu.ft. per min.?

Ans.—Provided there is no change made in the mine airway so as to increase or decrease the resisting power of any of the splits, each split will pass the same proportion of air as before the circulation was increased. The ratio of increase is 75,000 : 60,000, or 5 : 4. The quantity of air passing in the several splits after the circulation has been increased is, therefore, as follows:

Split A,	$2500 \times \frac{5}{4} = 3125$ cu.ft. per min.
Split B,	$1500 \times \frac{5}{4} = 1875$ cu.ft. per min.
Split C,	$2000 \times \frac{5}{4} = 2500$ cu.ft. per min.
Total....	7500 cu.ft. per min.

Ques.—If a barometer registers 30 in. at the surface or mouth of the shaft, what will it register at a point in the shaft, 1890 ft. below the surface?

Ans.—It is customary to allow one inch of increase in barometric pressure, for each 900 ft. of depth below the surface. Making this allowance, the increase of barometric pressure for 1890 ft. is $1890 \div 900 = 2.1$ in. The barometer would, therefore, register, in this case, $30 + 2.1 = 31.1$ in., which is approximately correct.

Ques.—What is the breaking strain of a plow-steel, hoisting rope, 1½ in. in diameter? Also, find the safe working load of this rope.

Ans.—Since the breaking strain of a 1-in., 6-strand, 19-wire, hoisting rope is 44 tons, and the strength of wire rope varies as the square of the diameter, the breaking load of a 1½ plow-steel, 6-strand, 19-wire rope is

$$L = 44\,d^2 = 44 \times 1.5^2 = 99 \text{ tons}$$

It is customary in ordinary hoisting to allow a factor of safety of 5, except for deep shafts, when this factor may be increased to 8 or 10. Using a factor of safety of 5, the safe working load is $99 \div 5 =$ say 20 tons.

Ques.—Given 10,000 cu.ft. of air circulating per minute, in an airway 8x10 ft., under a pressure of 10 lb. per sq.ft., what is the estimated length of the airway?

Ans.—The sectional area of the airway is $8 \times 10 = 80$ sq.ft. The velocity of the air current is $10{,}000 \div 80 = 125$ ft. per min. The total pressure (pa) on the entire sectional area of the airway is $10 \times 80 = 800$ lb. Since this total pressure is equal to the mine resistance (ksv^2)

$$ksv^2 = 800$$

and $$s = \frac{800}{0.00000002 \times 125^2} = 2{,}560{,}000 \text{ sq.ft.}$$

The perimeter of the airway is $2\ (8 + 10) = 36$ ft. The estimated length of the airway is, therefore: $2{,}560{,}000 \div 36 = 71{,}111$ ft. As this is an extraordinary length of airway, for a single current, it is probable that the above ventilating pressure should read 1 lb. instead of 10 lb. per sq.ft., which would make the length of airway practically 7000 ft.

Ques.—If a ventilating fan running at 80 r.p.m. produces a water gage of 3.75 in., and the fan is slowed down until the water gage reads 1.82 in., what is the speed of the fan?

Ans.—Approximately, the quantity of air in circulation varies as the speed of the fan; hence, since the pressure varies as the square of the quantity, the square root of the pressure varies as the speed. In other words, approximately, the square root of the pressure ratio is equal to the speed ratio. Calling the required speed of the fan x, we have

$$\frac{x}{80} = \sqrt{\frac{1.82}{3.75}} = \sqrt{0.4853} = 0.696$$

$$x = 80 \times 0.696 = \text{say } 56 \text{ r.p.m.}$$

Practically, the fourth power of the speed varies with the fifth power of the quantity of air in circulation; and the speed of the fan, for this reduction of pressure, would be about 51 r.p.m.

Ques.—What would be the ratio of expansion in an explosion of gas, assuming the original temperature of the gas to be 70 deg. F. and the temperature of the explosion 9564 deg. F.?

Ans.—The volume of gas or air varies as its absolute temperature; hence, the volume ratio or the ratio of expansion is equal to the absolute temperature ratio, and may be expressed as follows:

$$\frac{v_2}{v_1} = \frac{460 + 9564}{460 + 70} = \frac{10{,}024}{530} = 18.9$$

That is to say, the volume of the gas is expanded, at the moment of explosion, to 18.9 times its original volume.

Ques.—If 36,000 cu.ft. of air per min., is passing through an airway 6x10 ft., under a pressure of 3.6 lb. per sq.ft., what pressure will pass the same quantity of air through an airway 5x10 ft., of the same length?

Ans.—First, write the formula for pressure, in terms of the quantity of air in circulation; thus,

$$p = \frac{klo q^2}{a^3}$$

In this formula, the coefficient (k), the length (l), and the quantity (q) are constant; and p varies as the potential factor o/a^3. The perimeter and area of the first airway are: $o = 2\ (6 + 10) = 32$ ft.; $a = 6 \times 10 = 60$ sq.ft. The perimeter and area of the second airway are: $o = 2\ (5 + 10) = 30$ ft.; $a = 5 \times 10 = 50$ sq.ft., respectively.

In comparing these two airways, the pressure ratio is equal to the product of the perimeter ratio times the cube of the inverse area ratio. Thus, calling the required pressure x,

$$\frac{x}{3.6} = \frac{30}{32}\left(\frac{60}{50}\right)^3 = \frac{15}{16}\left(\frac{6}{5}\right)^3 = \frac{15}{16} \times \frac{216}{125}$$

$$x = \frac{3.6 \times 15 \times 216}{16 \times 125} = 5.8 \text{ lb. per sq.ft.}$$

COAL AND COKE NEWS

Washington, D. C.

Further evidence from the West Virginia field where the coal mining situation is being investigated by the special Senate Committee at work on the subject shows that there is more and more apparent certainty that there will be a positive finding against the coal mine operators, but that there is an increasing degree of certainty that nothing can be done with regard to them, no matter how severe may be the condemnation which the Committee for political reasons may choose to measure out to the operators.

The outbreak of Senator Martine during the past week with reference to the operations of the armored train which carried forces on behalf of the operators up into the regions where disorder was prevalent is regretted here by those who have been expecting to get a verdict against the mine owners as it is considered undignified and likely to prejudice the decision that may be finally arrived at.

It is understood that a final decision will not, however, be reached for some little time.

Free Coal Still on Tariff Bill

While some minor changes have been made in the paragraphs of the tariff bill relating to coal and its products, these remain substantially the same as reported by the Finance Committee of the Senate to the Senate caucus as they were in the original draft of the bill as it came from the House. The paragraphs in the free list as they stand in this latest draft reported on June 21 are as follows:

Coal, anthracite, bituminous, culm, slack, and shale; coke; compositions used for fuel in which coal or coal dust is the component material of chief value, whether in briquets or other form.

Coal tar, crude, pitch of coal tar, wood or other tar, dead or creosote oil, and products of coal tar known as anthracene and anthracene oil, naphthalin, phenol and cresol.

HARRISBURG, PENN.

The joint resolution introduced in the Senate by Senator Catlin calling for the appointment of a commission to investigate the causes of mine accidents in the anthracite region, has passed both houses and is now in the hands of the Governor for his signature.

The commission will have the authority to enter mines and make investigations, and will make tests and experiments to determine the efficacy and practibility of roof supporting materials and other methods of safety.

Dr. Holmes, director of the U. S. Bureau of Mines has tendered to the state of Pennsylvania, the use of the bureau's experimental station located at Pittsburgh, to make the necessary tests and to coöperate with the state in any effort that will tend toward the safety of those employed in the mines.

The governor is required to appoint within 30 days after the passage of the act three citizens from within the anthracite region one to be a competent mining engineer, one to be versed in anthracite mining and the other shall be a practical miner, to investigate into the causes of mine accidents. They will report the result of their investigations, etc., to the next General Assembly, together with such recommendations and drafts of such bills as in their judgment may be necessary.

Each member of the commission shall receive for his service $2400 per annum, and $25,000 is appropriated for the purpose of carrying into effect the provisions of this resolution. The commission is authorized to employ a secretary, stenographer and such other assistants as may be necessary.

The bill making it unlawful to mine or remove any pillars of coal in any anthracite mine where the seam has a pitch of 25 deg. or more unless two or more miners are employed and engaged at the same time, has passed both houses, but was amended in the Senate. The House would not concur in the amendment, and a committee from each branch has been appointed to confer on the bill, and as yet have not made a report thereon.

The Ehrhardt bill amending the act approved May 1, 1909, which provides for the health and safety of minors in bituminous coal mines and anthracite collieries or breakers by regulating the ages at which such persons may be employed, their hours of labor and prescribes rules for the obtaining of employment certificates, etc., extends to truant officers of the several districts the same right to prosecute violations of this act as has the Chief of the Department of Mines. This bill has been signed by the Governor and is known as "Act No. 48. Approved Apr. 15, 1913."

The McDermott bill has been introduced in the House making is unlawful to use electric current for any purpose in any room, breast or entry where miners are engaged in mining or loading coal in the mines of the Bituminous region that generate explosive gas. This does not apply however to the use of electricity in the main haulageways of these mines. This bill has passed second reading, and is receiving much opposition from the bituminous operators, who appeared before the mines and mining committee.

PENNSYLVANIA

Anthracite

Scranton—Another mine cave occurred in the vicinity of Prospect Avenue and Gibbons Street recently, but prompt action upon the part of the Illuminating Gas, and Water Works Co.s rendered the damage comparatively small. It is expected that the D., L. & W. Co. will repair all damage and leave both public and private property in as nearly the same condition as it was before the cave occurred as is possible.

Pittston—The North Pittston District of the Pennsylvania Coal Co. will be represented in the annual first aid meet to be held at Valley View in the fall by the Clarence team. The preliminary meet of the teams comprising this district was held in the Pittston Y. M. C. A., and the winning team received the high score of 97¾.

Wilkes-Barre—The Lehigh Valley Coal Co. will publish the first issue of its new employees magazine early in July. This is to be a monthly and will contain news from all the divisions and from the general offices, as well as articles on mining topics.

Bituminous

Monongahela—The Cincinnati mine of the Monongahela River Consolidated Coal and Coke Co., in which 97 men lost their lives in an explosion on Apr. 23, will resume operations shortly. A new ventilating system has been installed, together with a new gas proof electric coal cutting machine. Fifty men have been at work cleaning up the mine for some time.

WEST VIRGINIA

Charleston—The United Mine Workers of America have decided to call a strike in district 29, embracing Raleigh and Fayette counties, and affecting approximately 15,000 men.

Wheeling—Three hundred miners at the Pultney mine of the George M. Jones Coal Co., south of Bellaire, O., struck June 19. District officers from Bridgeport are making an effort to adjust the trouble.

OHIO

Columbus—The commission appointed by Governor Cox June 7 to investigate the report on the equitable method of weighing coal in the mines of Ohio met recently and organized by electing Judge Phil M. Crow, of Kenton, chairman and Prof. M. B. Hammond, of the Ohio State University, secretary. It is announced that sessions will start soon and that trips will be made by the commission to every mining district in the state. Testimony will be taken both from mine owners and miners. The commission will report its findings to the Governor early in the winter, in time to have it submitted to the General Assembly which meets in extraordinary session shortly after the first of the year.

INDIANA

Evansville—The old Ingle coal mines, owned by James H. Moore, of this city, and closed several weeks ago because of a fire, will reopen about July 10. More than 100 miners will be employed.

Oakland City—The Peacock Coal and Mining Co., owner of the Massey mines near this city, will abandon the present workings and sink a new shaft this summer.

Lyons—While drilling for oil on the farm of Mrs. Anna Grounds, a vein of coal nine feet thick was struck.

Sedalia—The Sedalia Lumber and Coal Co. of this town has filed preliminary notice of dissolution.

Indianapolis—The proposed increase from 50c. to 55c. a ton for coal, carried fr m the Indiaa fields to Indianapolis has been withdrawn by the Indiana carriers. It was vigorously opposed by shippers and buyers.

Fremont—The Fremont Lumber and Coal Co. has been incorporated here, with $10,000 capital stock, to deal in fuel. The directors are E. C. Shupp, N. G. Ball and H. I. Isbell.

ILLINOIS

Duquoin—The Leiter colliery, at Zeigler, which has been sealed up for years as the result of a series of explosions in which nearly 100 men lost their lives, was recently reopened. The task of the experts who unsealed this mine is said to have b en one of the most difficult in the history of mining in Illinois.

FOREIGN NEWS

Düsseldorf, Germany—Rescuers on June 19 saved the lives of fifteen miners who were imprisoned the previous day at Lindorf by the caving in of the shaft of a coal mine.

Rotherham, England—Eight men were drowned June 17 and as many more had narrow escapes when Brown's colliery, near here, was flooded. It is believed that in extending a tunnel the workmen accidentally struck some old workings, resulting in the flooding of the mine.

Toronto, Canada—The ninth annual meeting of the Canadian Retail Coal Association was held at Toronto on June 19 and 20 with an attendance of 176 members from various points in Ontario. The delegates were welcomed to the city by Controller Church. The reply to this greeting was made by one of the directors, J. C. Hay. After the reports of officers, addresses were delivered on "The Labor Problem Solved for the Coal Merchant," by J. A. W. Archer, and "Coal from Mine to Consumer," by W. H. Lesser, an engineer of the Philadelphia & Reading Coal & Iron Co. The latter address was illustrated by 150 slides showing in an interesting way the evolution of coal.

PUBLICATIONS RECEIVED

Journal of the American Society of Naval Engineers—May, 1913, Vol. 25, No. 2.

Western Society of Engineers—Journal for May, 1913, pages, 329-446; 6x9 in.; with many insert figures and diagrams.

The Illinois Coal Mining Investigations—Preliminary Report on Organization and Method of Investigation; 71 pages 6x9 in., 26 figures and illustrations.

Department of the Interior—Bureau of Mines. The Flash Point of Oils, Methods and Apparatus for its Determination. By Irving C. Allen and A. S. Crossfield; 31 pages 6x9 in. two figures.

Department of the Interior—Bureau of Mines. Monthly Statement of Coal Mine Fatalities in the United States, April, 1913, with revised figures for preceding months. Compiled by Albert H. Fay; 15 pages, 6x9 in.

University of Illinois—Bulletin No. 65. The Steam Consumption of Locomotive Engines from Indicator Diagrams. By J. Paul Clayton. Seventy seven pages, 6x9 in. Numerous illustrations, curves and diagrams.

University of Illinois—Bulletin No. 66. The Properties of Saturated and Superheated Ammonia Vapor. By G. A. Goodenough and Wm. Earle Mosher; 94 pages, 6x9 in.; with numerous diagrams, curves and tables.

TRADE CATALOGS

Atlas Powder Co.—Wilmington, Del. High Explosives, Blasting Powder and Blasting Supplies; 107 pages 6x9 in. with numerous illustrations and diagrams describing the selection, storage and use of high explosives.

New York and New Jersey Lubricant Co., 165 Broadway, New York, Bulletin No. 21, April, 1913. Hyatt Roller Lubricants for mine car wheels equipped with Hyatt flexible roller bearings; 11 pages, 7½x10 in.; illustrated.

Sullivan Machinery Co.—Bulletin 58-M. Sullivan Cross-Compound Power-Driven Air Compressors; 19 pages, 6x9 in. Also Bulletin 66-M Sullivan Hammer Drills for Quarry Purposes and Stone Dressing Tools. Also Booklet 112 Sullivan Air Compressors.

PERSONALS

Edgar A. Perkins has been appointed chief mine inspector to take the place of Elliott R. Hooton, effective May 1.

L. Blenkinsopp has been appointed mine inspector for the 11th West Virginia district,, with headquarters at Welch, W. Va.

Alfred G. Heggem, of Pittsburgh, has been appointed petroleum engineer in the Bureau of Mines, at a salary of $3000 per annum.

J. C. Koslem has resigned as president of the Indiana Coal Operators' Association, after ten years of continuous service. Hugh Shirkie succeeds him.

A. J. Sayers, engineer in charge of the tipple and washery work of the Link-Belt Co., has just returned from a four weeks' trip in the Utah coal mining district.

Julius Anson has discovered a 4-ft. vein of coal on a deserted farm 9 miles from Boise, Ida.. It is expected that the Idaho Northern Ry. will build a spur for the purpose of developing this deposit.

George Sylvester, chief mine inspector of Tennessee has appointed the following deputy mine inspectors: John Rose, H. H. Braden and W. A. Overall. The appointments are for a period of 2 years, commencing June 1, 1913. H. B. Jackson, a former stenographer, has been appointed clerk and statistician for the mining board.

John T. Diehm, of Bluffton, Ind., was recently elected president of the Michigan-Ohio Coal Dealers' Association, succeeding Robert Lake, of Jackson, Mich., who declined renomination. The other officers elected were: Vice-President, J. W. Ballard, of Detroit; Secretary, B. F. Nigh, of Columbus; Treasurer, W. A. Gibson, of Upper Sandusky. These were all elected by acclamation.

COAL AND COKE PATENTS

Miner's Lamp—W. P. Rice, Regina, Ky., 1,062,504, May 20, 1913. Filed Sept. 11, 1912. Serial No. 719,795.

Coal Drill—J. G. Huntley, Pittston, Penn., 1,055,464, March 11, 1913. Filed Sept. 3, 1912. Serial No. 718,303.

Coaling System. D. A. Lee, Centerville, Iowa. 1,048,325, Dec. 24, 1912. Filed Apr. 3, 1912. Serial No. 688,241.

Smoke Consumer—W. Kelly, Memphis, Tenn., 1,002,473, May 20, 1913. Filed Aug. 3, 1912. Serial No. 713,077.

Mining Car. L. G. Helmick, Fairmont, W. Va. 1,048,309, Dec. 24, 1912. Filed July 15, 1912. Serial No. 709,581.

Smoke Consumer—A. E. Wilson, Indianapolis, Ind., 1,060,-051. Apr. 29. 1913. Filed Oct. 30. 1911. Serial No. 67.534.

Smoke Consumer—J. H. Ottman, Milwaukee, Wis., 1,059,-559, Apr. 22, 1913. Filed Oct. 14, 1909. Serial No. 522,565.

Improvements in and Relating to Miners' Safety Lamps. No. 4193 of 1913. J. Naylor, 23 The Wiend, Wigan, England.

Hand Machine to Undermine Coal—A. Roe, Beaver, Ohio, 1,062,854, May 27, 1913. Filed June 18, 1912. Serial No. 704,-286.

Automatic Coaling Bucket—J. T. Richards, Chicago, Ill., 1,062,359, May 20, 1913. Filed Mar. 22, 1911. Serial No. 616,-194.

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Tender Coal Gate. M. A. Smith and T. J. Thornton. Albion, Penn. 1,048,222, Dec. 24, 1912. Filed Apr. 13, 1912. Serial No. 690,580.

Mining Tool—L. F. Hess assignor to Hess Dustless Mining Co., Ansted, W. Va., 1,059,463, Apr. 22, 1913. Filed Oct. 4, 1912. Serial No. 725,951.

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Improvements in Blasting Detonators for Coal Mining and Like Purposes. No. 15,600 of 1912. W. A. Malson, Sheffield Road, Chesterfield, England.

Mining Tool. C. L. Aragon, assignor of one-half to O. Ellmore; both of Ely, Nev. 1,047,910, Dec. 24, 1912. Filed Oct. 12, 1911. Serial No. 654,396.

Coal Washing Apparatus—A. France, rue de l'Esperance, 223, Liege, Belgium, and P. Habets, Montegnee, Belgium. Filed in London, 22,655 of 1912.

Blower for Boilers—J. Magee assignor to Diamond Power Specialty Co., Detroit, Mich., 1,059,479, Apr. 22, 1913. Filed July 22, 1912. Serial No. 711,014.

Chamber Ovens—Especially Such as Are Suitable for the Manufacture of Coke or Gas. No. 19,812 of 1912. N. Lengersdorff, of Bunzlau, Silesia, Germany.

Gas Producer—W. F. Luick and A. J. Bassett, assignor to Luick-Bassett Producer Co. a corporation of Wisconsin, 1,062,721, May 27, 1913. Filed Oct. 2, 1911. Serial No. 652,-396.

Improvements in Methods of Mining Coal, Converting it into Gas, and Then Conveying the Gas from the Mine. J. H. Hoadley, 18 East 82d St., New York, U. S. A., 14,494 of 1912.

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Charleston, W. Va.—The Monroefield Coal Co.; capital stock, $10,000; to deal in real estate, coal and mineral land, etc. Incorporators: J. A. Martin, W. J. Snee, M. C. Martin, F. P. Weaver, B. C. Weaver.

Lyons—While drilling for oil on the farm of Mrs. Anna Grounds, a vein of coal nine feet thick was struck.

Sedalia—The Sedalia Lumber and Coal Co. of this town has filed preliminary notice of dissolution.

Indianapolis—The proposed increase from 50c. to 55c. a ton for coal, carried fr m the Indiaa fields to Indianapolis has been withdrawn by the Indiana carriers. It was vigorously opposed by shippers and buyers.

Fremont—The Fremont Lumber and Coal Co. has been incorporated here, with $10,000 capital stock, to deal in fuel. The directors are E. C. Shupp, N. G. Ball and H. I. Isbell.

ILLINOIS

Duquoin—The Leiter colliery, at Zeigler, which has been sealed up for years as the result of a series of explosions in which nearly 100 men lost their lives, was recently reopened. The task of the experts who unsealed this mine is said to have b en one of the most difficult in the history of mining in Illinois.

FOREIGN NEWS

Düsseldorf, Germany—Rescuers on June 19 saved the lives of fifteen miners who were improsoned the previous day at Lindorf by the caving in of the shaft of a coal mine.

Rotherham, England—Eight men were drowned June 17 and as many more had narrow escapes when Brown's colliery, near here, was flooded. It is believed that in extending a tunnel the workmen accidentally struck some old workings, resulting in the flooding of the mine.

Toronto, Canada—The ninth annual meeting of the Canadian Retail Coal Association was held at Toronto on June 19 and 20 with an attendance of 176 members from various points in Ontario. The delegates were welcomed to the city by Controller Church. The reply to this greeting was made by one of the directors, J. C. Hay. After the reports of officers, addresses were delivered on "The Labor Problem Solved for the Coal Merchant," by J. A. W. Archer, and "Coal from Mine to Consumer," by W. H. Lesser, an engineer of the Philadelphia & Reading Coal & Iron Co. The latter address was illustrated by 150 slides showing in an interesting way the evolution of coal.

PUBLICATIONS RECEIVED

Journal of the American Society of Naval Engineers—May, 1913, Vol. 25, No. 2.

Western Society of Engineers—Journal for May, 1913, pages, 329-446; 6x9 in.; with many insert figures and diagrams.

The Illinois Coal Mining Investigations—Preliminary Report on Organization and Method of Investigation; 71 pages 6x9 in., 26 figures and illustrations.

Department of the Interior—Bureau of Mines. The Flash Point of Oils, Methods and Apparatus for its Determination. By Irving C. Allen and A. S. Crossfield; 31 pages 6x9 in. two figures.

Department of the Interior—Bureau of Mines. Monthly Statement of Coal Mine Fatalities in the United States, April, 1913, with revised figures for preceding months. Compiled by Albert H. Fay; 15 pages, 6x9 in.

University of Illinois—Bulletin No. 65. The Steam Consumption of Locomotive Engines from Indicator Diagrams. By J. Paul Clayton. Seventy seven pages, 6x9 in. Numerous illustrations, curves and diagrams.

University of Illinois—Bulletin No. 66. The Properties of Saturated and Superheated Ammonia Vapor. By G. A. Goodenough and Wm. Earle Mosher; 94 pages, 6x9 in.; with numerous diagrams, curves and tables.

TRADE CATALOGS

Atlas Powder Co.—Wilmington, Del. High Explosives, Blasting Powder and Blasting Supplies; 107 pages 6x9 in. with numerous illustrations and diagrams describing the selection, storage and use of high explosives.

New York and New Jersey Lubricant Co., 165 Broadway, New York, Bulletin No. 21, April, 1913. Hyatt Roller Lubricants for mine car wheels equipped with Hyatt flexible roller bearings; 11 pages, 7½x10 in.; illustrated.

Sullivan Machinery Co.—Bulletin 58-M. Sullivan Cross-Compound Power-Driven Air Compressors; 19 pages, 6x9 in. Also Bulletin 66-M Sullivan Hammer Drills for Quarry Purposes and Stone Dressing Tools. Also Booklet 112 Sullivan Air Compressors.

PERSONALS

Edgar A. Perkins has been appointed chief mine inspector to take the place of Elliott R. Hooton, effective May 1.

L. Blenkinsopp has been appointed mine inspector for the 11th West Virginia district,, with headquarters at Welch, W. Va.

Alfred G. Heggem, of Pittsburgh, has been appointed petroleum engineer in the Bureau of Mines, at a salary of $3000 per annum.

J. C. Koslem has resigned as president of the Indiana Coal Operators' Association, after ten years of continuous service. Hugh Shirkle succeeds him.

A. J. Sayers, engineer in charge of the tipple and washery work of the Link-Belt Co., has just returned from a four weeks' trip in the Utah coal mining district.

Julius Anson has discovered a 4-ft. vein of coal on a deserted farm 9 miles from Boise, Ida.. It is expected that the Idaho Northern Ry. will build a spur for the purpose of developing this deposit.

George Sylvester, chief mine inspector of Tennessee has appointed the following deputy mine inspectors: John Rose, H. H. Braden and W. A. Overall. The appointments are for a period of 2 years, commencing June 1, 1913. H. B. Jackson, a former stenographer, has been appointed clerk and statistician for the mining board.

John T. Diehm, of Bluffton, Ind., was recently elected president of the Michigan-Ohio Coal Dealers' Association, succeeding Robert Lake, of Jackson, Mich., who declined renomination. The other officers elected were: Vice-President, J. W. Ballard, of Detroit; Secretary, B. F. Nigh, of Columbus; Treasurer, W. A. Gibson, of Upper Sandusky. These were all elected by acclamation.

COAL AND COKE PATENTS

Miner's Lamp—W. P. Rice, Regina, Ky., 1,062,504, May 20, 1913. Filed Sept. 11, 1912. Serial No. 719,795.

Coal Drill—J. G. Huntley, Pittston, Penn., 1,055,464, March 11, 1913. Filed Sept. 3, 1912. Serial No. 718,303.

Coaling System. D. A. Lee, Centerville, Iowa. 1,048,325, Dec. 24, 1912. Filed Apr. 3, 1912. Serial No. 688,241.

Smoke Consumer—W. Kelly, Memphis, Tenn., 1,002,473, May 20, 1913. Filed Aug. 3, 1912. Serial No. 713,077.

Mining Car. L. G. Helmick, Fairmont, W. Va. 1,048,309, Dec. 24, 1912. Filed July 15, 1912. Serial No. 709,581.

Smoke Consumer—A. E. Wilson, Indianapolis, Ind., 1,060,-051. Apr. 29. 1913. Filed Oct. 30. 1911. Serial No. 67.534.

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INDUSTRIAL NEWS

Bens Creek, Penn.—The Old Piper Mine, at Bens Creek, has been abandoned and dismantled. The mine has been in operation for more than 60 years.

Du Bois, Penn.—It is reported that the Brush Run Coal Co. is preparing to operate a new coal field in Jefferson County by the stripping process.

Widnoon, Penn.—Operations of the Widnoon Coal Mining Co. were suspended for four days last week on account of breaking of cables which carried their coal across the river in buckets.

Traer, Iowa—The Rock Island R.R. is said to be making Traer a coaling station. Work has been begun on a plant 100 ft. east of the depot, which will have a capacity of 200 tons, and will be automatic.

Connellsville, Penn.—F. M. Tompkins has secured a lease on a coal acreage owned by the Cambria County Coal Co., near Portage. An opening is to be made on the upper end of Trout Run in the C prime bed of coal.

McArthur, Ohio—R. B. Cutter and H. B. Stevenson of Parkersburg, W. Va., have purchased the assets of the Mohr-Minton mines of the Mohr-Minton Co. The assets consist of coal mines and a brick plant near McArthur.

Connellsville, Penn.—The Consolidation Coal Co. is opening a new mine at Wilson Creek to supplant the old workings which are now approaching exhaustion. The new heading has already been driven some distance into the coal.

Terre Haute, Ind.—The Jackson Hill Mining Co. has contracted to furnish the Inland Steel Co., at Chicago, with several hundred tons of coal daily for the next five years. Crawford Fairbanks is president of the mining company.

Chattanooga, Tenn.—H. F. Noyes has been appointed receiver for the Dayton Coal & Iron Co. It is said that the assets of the company would invoice about one million dollars, including furnaces at Dayton. The liabilities were not stated.

Pleasantville, Iowa—The city of Pleasantville has recently employed M. B. Flanders to prospect for a municipal bed of coal in the suburbs of that city. Mr. Flanders has a diamond core drill at work at that point and says that he expects to strike coal at a depth of 300 ft. or more.

Browders, Ky.—The tipple, power house and machine shop of the Caldwell Coal Co., in the western Kentucky coal district, was destroyed by fire recently, with a loss between $20,000 and $30,000. The cause of the fire is as yet unknown. No men were in or around the mine at the time of the fire.

Louisville, Ky.—The O'Donnell Coal Co. has been incorporated with a capital stock of $50,000, for the purpose of operating a number of coal mines which will shortly become the property of the company. The incorporators are Joseph W. O'Donnell, M. O'Donnell and M. Lanning, all of Louisville.

New Orleans, La.—Owing to the low stage of the Ohio River the coal movement from Pittsburgh for New Orleans has been stopped. As the high stage began early this year, more coal has been brought down the river than in any other year in the history of the industry. The movement of Kentucky coal will continue.

Monongahela, Penn.—It is reported that several large tracts of coal land have been leased in the vicinity of Bentleyville, within the past few weeks, and that some important trades are now underway. It is said that one of the companies will haul its coal several miles underground in order to bring the product to the mine opening.

Chattanooga, Tenn.—Investigation of the affairs of the Dayton Coal & Iron Co., which has been placed in the hands of a receiver, shows that the local company was doing a profitable business. The cause of the assignment is the failure of James Watson and Sons, of Glasgow. This firm held a controlling interest in the Dayton company.

Martins Ferry, Ohio—Chief mine inspector, J. C. Davies, several deputy mine inspectors and a number of representatives of the Pittsburgh Vein Operators' Association met June 16 to start upon an inspection trip of the mines in the No. 8 coalfield, with a view to making recommendations for improving the safety of operation, as well as the production.

Portland, Ore.—The mines of the Beaver Hill Coal Co. are in operation although there is considerable agitation over wages and a number of strikes have been the result. The labor organization is trying to get a foothold in the mines but with little success. Each mine has its own scale of wages and hours of work per day, so it is not a Union camp, as yet.

Birmingham, Ala.—A recent electrical installation by the Alabama Power Co., reduced the cost of operation of the plant from $45,000 per annum to $18,000 per annum, making a saving of $27,000 yearly, which was practically the cost of the new installation, and which, therefore, would pay for itself in one year. This is a good illustration of the saving effected by electrical installation in large plants now operated by steam power.

Dubois, Penn.—The Northwestern Mining and Exchange Co. has broken ground for a big electric power plant that is planned to be one of the largest in this section of the state, It will be located a mile above Brockport close to the Johnson Run coal tract.

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In bituminous, the West Virginia strike situation is assuming serious proportions again, and the Eastern bituminous market hinges almost entirely on developments there. As a result, the trade is firm in every particular, many operators being forced into the open market for prompt tonnages to fill out their contract obligations. There has been a perceptible rush to cover on the part of consumers, and preparations for the worst are being made at a number of points. At the moment there is a good car supply, but the feeling prevails that there will be a serious shortage the coming fall. Operators, as a rule, are afraid to accept further orders, and the situation in the Eastern market may be regarded as fairly tense at the present time.

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With government colliers and steamers for foreign consignment, at Hampton Roads, there has begun to be an accumulation of tonnage and even slower loading is in prospect for coastwise transportation. There has been talk of $3 f.o.b. as an asking price for spot coal but no sales above $2.85 have been reported. Practically every shipper has all the business he dares take, and there is hardly any prompt coal offering. There is trouble hinted at in Pocahontas as well, and it will be an entirely new situation if both fields are kept from producing for any appreciable period. The situation is being anxiously watched, but there have been no marked developments in this market as yet.

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Baltimore*	.....	2.58@2.73	2.85@2.95	
Hampton Roads*				$2.85 *firm*
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INDUSTRIAL NEWS

Bens Creek, Penn.—The Old Piper Mine, at Bens Creek, has been abandoned and dismantled. The mine has been in operation for more than 60 years.

Du Bois, Penn.—It is reported that the Brush Run Coal Co. is preparing to operate a new coal field in Jefferson County by the stripping process.

Widnoon, Penn.—Operations of the Widnoon Coal Mining Co. were suspended for four days last week on account of breaking of cables which carried their coal across the river in buckets.

Traer, Iowa—The Rock Island R.R. is said to be making Traer a coaling station. Work has been begun on a plant 100 ft. east of the depot, which will have a capacity of 200 tons, and will be automatic.

Connellsville, Penn.—F. M. Tompkins has secured a lease on a coal acreage owned by the Cambria County Coal Co., near Portage. An opening is to be made on the upper end of Trout Run in the C prime bed of coal.

McArthur, Ohio—R. B. Cutter and H. B. Stevenson of Parkersburg, W. Va., have purchased the assets of the Mohr-Minton mines of the Mohr-Minton Co. The assets consist of coal mines and a brick plant near McArthur.

Connellsville, Penn.—The Consolidation Coal Co. is opening a new mine at Wilson Creek to supplant the old workings which are now approaching exhaustion. The new heading has already been driven some distance into the coal.

Terre Haute, Ind.—The Jackson Hill Mining Co. has contracted to furnish the Inland Steel Co., at Chicago, with several hundred tons of coal daily for the next five years. Crawford Fairbanks is president of the mining company.

Chattanooga, Tenn.—H. F. Noyes has been appointed receiver for the Dayton Coal & Iron Co. It is said that the assets of the company would invoice about one million dollars, including furnaces at Dayton. The liabilities were not stated.

Pleasantville, Iowa—The city of Pleasantville has recently employed M. B. Flanders to prospect for a municipal bed of coal in the suburbs of that city. Mr. Flanders has a diamond core drill at work at that point and says that he expects to strike coal at a depth of 300 ft. or more.

Browders, Ky.—The tipple, power house and machine shop of the Caldwell Coal Co., in the western Kentucky coal district, was destroyed by fire recently, with a loss between $20,000 and $30,000. The cause of the fire is as yet unknown. No men were in or around the mine at the time of the fire.

Louisville, Ky.—The O'Donnell Coal Co. has been incorporated with a capital stock of $50,000, for the purpose of operating a number of coal mines which will shortly become the property of the company. The incorporators are Joseph W. O'Donnell, M. O'Donnell and M. Lanning, all of Louisville.

New Orleans, La.—Owing to the low stage of the Ohio River the coal movement from Pittsburgh for New Orleans has been stopped. As the high stage began early this year, more coal has been brought down the river than in any other year in the history of the industry. The movement of Kentucky coal will continue.

Monongahela, Penn.—It is reported that several large tracts of coal land have been leased in the vicinity of Bentleyville, within the past few weeks, and that some important trades are now underway. It is said that one of the companies will haul its coal several miles underground in order to bring the product to the mine opening.

Chattanooga, Tenn.—Investigation of the affairs of the Dayton Coal & Iron Co., which has been placed in the hands of a receiver, shows that the local company was doing a profitable business. The cause of the assignment is the failure of James Watson and Sons, of Glasgow. This firm held a controlling interest in the Dayton company.

Martins Ferry, Ohio—Chief mine inspector, J. C. Davies, several deputy mine inspectors and a number of representatives of the Pittsburgh Vein Operators' Association met June 16 to start upon an inspection trip of the mines in the No. 8 coalfield, with a view to making recommendations for improving the safety of operation, as well as the production.

Portland, Ore.—The mines of the Beaver Hill Coal Co. are in operation although there is considerable agitation over wages and a number of strikes have been the result. The labor organization is trying to get a foothold in the mines but with little success. Each mine has its own scale of wages and hours of work per day, so it is not a Union camp, as yet.

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NEW YORK

Bituminous—The local market on soft coal is firmer, alarming reports regarding the labor situation in West Virginia having caused prices to harden quite perceptibly. The consumption continues large in all directions, but the movement is almost entirely on contract. Further contracts are being delayed pending a return of more settled conditions in West Virginia; at the present moment operators would not consider entering into any further agreement for tonnage.

Production at the mines continues at a high rate. While the labor supply is not up to full requirements, it is still fairly plentiful, the chief difficulty being the numerous holidays which the miners insist on taking. The car supply is fair and fully up to the requirements of the mines. The local market is not quotably changed, and we continue previous quotations with prices firm in every respect as follows: West Virginia steam, $2.55@2.60; fair grades of Pennsylvania, $2.65@2.70; good grades of Pennsylvania, $2.75@2.80; best Miller Pennsylvania, $3.05@3.15; George's Creek, $3.25@3.30.

Local water freights are firm with tonnage difficult to obtain.

Anthracite—The last week of the month naturally sees some activity in hard coal as dealers and consumers are anxious to buy before the next reduction in the discount. Aside from this temporary activity the general trade is dull and flat. Furthermore, this condition will no doubt prevail now until September, since the discount during the intervening months is too small to interest the buyers generally.

On the whole, however, the market is in a fairly strong position, considering the period of the year, and is fully as good, if not better than is to be expected at this time. Stove coal is still in rather short supply, while dealers are becoming overstocked with chestnut and buckwheat. The domestic sizes of all kinds are dull, but as a rule are not so flat as the steam grades. Some companies report that they are entirely cleaned up on rice coal, but there is no doubt that plenty of this could be obtained for reasonably prompt shipment.

The New York hard coal market is quotable about on the following basis:

		Individual		
	Circular	Lehigh	Scranton	Schuykill
Broken	$5.00	$5.00	....	....
Egg	5.25	4.55	....	....
Stove	5.25	4.85	....	....
Chestnut	5.50	....	....	$4.90
Pea	3.50	3.60	....	....
Buckwheat	2.75	....	$2.50	2.15
Rice	2.25	....	2.25	1.80
Barley	1.75	....	....	1.15

PHILADELPHIA, PENN.

The anthracite coal trade is beginning to show additional signs of slowing up in this particular vicinity. All the dealers are complaining about lack of business, although admitting that the conditions are not abnormal, but the contrast between what they were doing last year and now is so marked, that they are inclined to feel somewhat dissatisfied. Last year, the market was absorbing everything from broken to barley, but this year being a normal one, with no strike demand, the dealers find the situation hardly to their liking.

The tidewater business to the East still continues good. Every week sees large sailings of barges en route for the New England market, and while the demand here is not so insistent, there seems to be another order ready as soon as the last one is shipped. All the mines are still continuing operations, although it is understood that partial suspensions are looked for during the coming month. Outside of the small sizes, very little coal has as yet gone into stock, and the demand may be such, with the curtailed mining during July and August, that the market will be able to take care of the output. There is talk of some cutting on the part of the individual operators, although confined to certain sizes. Stove coal seems to be about the only grade in this market that finds a ready sale.

The pressure for bituminous coal seems to have shaded off somewhat during the week, and in some quarters, operators are inclined to believe that the change for the better is not to be as lasting as many expected. Prices are well maintained, however, and the softening of the market is commented on by many as being only temporary.

BALTIMORE, MD.

The possibilities of a protracted shutdown in the West Virginia mining regions, because of the labor troubles there, is having its effect on the local market. A number of consumers who have heretofore consistently refused to contract, signed up at the increased prices asked during the week, rather than face the possibility of being caught in a short market. The situation in the New River and Pocahontas fields, which supply much of the fuel here, is openly regarded with alarm.

As a consequence the local market remains firm in every particular. The demand for all grades is quite persistent, and reports are current that some of the large operators have such an excess of orders that they are being forced to buy from competitors in order to make prompt delivery. Line business is particularly heavy, while shipments at the piers have been active all week, and low-grade coals are in ready demand at 95c. to $1. There has been a slight improvement in the car situation, but still more equipment could be used, were it available; the lake movement continues as heavy as ever.

One of the interesting features at the moment is the coming announcement of the award of the municipal coal contract for 45,000 tons during the current year, on which a dozen or more companies are competing. The hot spell has eliminated any further interest in the anthracite market, and coke continues weak, with production still further reduced.

BUFFALO, N. Y.

Bituminous dealers are, in some cases, advising an advance in quotations. There is no surplus coal anywhere and it is difficult to get up an extra cargo or fill a rush order. Pittsburgh is steadily reporting that contracts are taking the entire output and such is also the case to a great extent in the Allegheny Valley; this in spite of the reports of shut downs by the iron furnaces, a sort of contradiction that coal men do not try to reconcile. Coal sells briskly and that is enough. So much coal is going to the lakes to make up the annual demand for 12 million tons that it is hard to get enough to go around in other parts of the market. Cases are reported where Lake Ontario shippers have paid more for coal than they are to get for it, being obliged to borrow and buy all they could find to make out a cargo.

Still, the conservative side of the trade is against any direct recognition of the stiffness and it may be well to wait another week before quotations are changed. It is becoming evident that the actions of Congress are not being taken seriously. If the crops are as good as they now promise to be the present activities will go on, regardless. At the same time it is uncertain what the markets will be in the near future. A state institution is asking for bids on a lot of slack to be furnished for a year beginning with next October, but the jobbers are not prepared to gamble to that extent. It looks as if big prices will have to be paid if a contract is made at all, as was the case with the city water-works contract.

Quotations will therefore remain strong at $2.80 for Pittsburgh lump, $2.65 for three-quarter, $2.55 for mine-run and $2.15 for slack. Coke, however, is not at all strong at former figures, $4.85 for best Connellsville foundry. Allegheny Valley coal is about 25c. under Pittsburgh. There is no change in smithing coal, which is subject to few fluctuations.

A leading reason for the shortage of bituminous is the scarcity of men in the mines and a lesser scarcity of cars, the two often conspiring to spoil a week's mning; no improvement in either direction is looked for right away and only a falling off in demand can make coal plenty.

There is no stir in anthracite. Shipments by lake are heavy, being 191,000 tons for the week.

COLUMBUS, OHIO

Trade in all grades of coal in Ohio has been quite active during the past week. The demand is distributed among the domestic and steam grades and prices all along the list have been well maintained. On the whole the market is in good condition and operators as well as shippers believe that quotations will be raised in the near future.

One of the best features of the trade is the activity shown in domestic sizes. Dealers are stocking up in preparation of the expected demand from householders; it is believed that their stocking period will arrive sooner than usual and dealers are preparing for this. Dealers' stocks as a rule, are light because of the demand upon them incidental to the flood. The extra large harvest in Ohio is also expected to furnish a market for threshing purposes.

Steam business is steady in every way; manufacturing plants are taking a large tonnage and a few show a disposition to stock up to guard against the expected car shortage. Plants in the iron and steel trade are large users of fuel and in fact a marked improvement is reported in manufacturing circles generally, railroad fuel is also in good demand there being a large freight movement. Most of the railroad contracts have been made, although a few are still hanging fire.

The tonnage moving from Ohio and West Virginia fields to the Northwest via the lakes and the docks is heavy. No

congestion of consequence has taken place either at the docks or with the vessels.

Production in all Ohio fields has been large during the past few weeks. Excepting in Eastern Ohio, there is not much trouble over the car supply and all of the mines are working with a large force. Some trouble is experienced in certain districts from a labor shortage. In the Eastern Ohio district the output is estimated at 65 per cent. and in the Pomeroy Bend field it has been 75 per cent. In the Hocking Valley, where car shortage has not affected the output the production has been about 90 per cent. of capacity. In the strictly domestic fields the output is gradually increasing.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1.50		$1.60	$1.50
2 inch	1.35	$1.20	1.35	1.30
Nut	1.20		1.25	
Mine-run	1.15	1.10	1.15	1.10
Nut, pea and slack	0.65		0.65	0.60
Coarse slack	0.55	0.55	0.55	0.50

HAMPTON ROADS, VA.

Although there has been a continued scarcity of coal at all Tidewater piers, at the same time the dumpings have been fair and, with coal coming in daily, the end of this week finds conditions practically the same as they have been for the past month. The majority of the suppliers are taking care of contracts but are not soliciting new business or making outside sales; $2.90 has been about the prevailing price offered by buyers for spot coal but operators are preferring to hold what coal they have for contract tonnage about due and early July shipment.

Two of the largest shipments made during the week went into the U. S. Naval Colliers "Orion" at Lamberts Point and the "Proteus" at Newport News. This latter vessel is just from the Newport News shipbuilding and drydock plant and the 12,500 tons which went into her was the first cargo she had taken. She is now on her trial trip and it is expected she will be formally turned over to the Government during the next week or ten days.

BIRMINGHAM, ALA.

There is a slight heaviness noticeable in the local steam market, so that some operators are pushing their sales agents for more business. No serious alarm is felt over the situation, however, as similar conditions appear every summer; as a matter of fact they have been less frequent so far this season than ever before.

Prices on Alabama foundry and furnace coke remain unchanged, although there has been a considerable reduction on the West Virginia cokes which enter into competition with the local product in certain of the Southern markets. Reports on business conditions in the South are encouraging, and indications point to a highly profitable business the coming fall.

DETROIT, MICH.

Bituminous—Full list prices are being obtained on contract shipments with fairly substantial premiums being offered for spot delivery. Buyers are now finding that it is not so easy to place orders as they had anticipated it would be. The domestic grades are the feature of the situation at the present time, the inquiry being heavy, and a good stiff asking price prevailing; dealers are unanimous in the belief that these coals will bring from 75c. to $1 more than during last season, and all are anxious to obtain a good stock and assure themselves of a steady supply through the winter.

The local market is quotable on about the following basis:

	W. Va. Splint	Gas	Hocking	Cambridge	No. 8 Ohio	Pocahontas	Jackson Hill
Domestic lump	$1.70	....	....	....	....	$2.25	$2.00
Egg	1.70	....	....	....	....	2.25	2.00
Steam lump	1.40	....	....	....	....	....	....
4-in. lump	1.25	$1.25	$1.25	$1.25	$1.25	....	....
Mine-run	1.10	1.10	1.10	1.10	1.10	1.50	....
Slack	0.85	0.85	0.85	0.85	0.85	....	....

Anthracite—Orders for hard coal are coming in fully as fast as last month, and there does not seem to be any easing off likely to occur at any time in the immediate future. The movement is quite heavy, and many dealers are unable to obtain prompt shipments, due apparently to the scarcity of cars at the mines.

Coke—The local coke market has not been active during the week, because several of the large local foundries have been compelled to suspend operations; this, of course, had an immediate effect on the trade. The market is now quotable about as follows: Connellsville, $2.25; Sement Solvay, $2.85 and Gas House, $2.75, f.o.b. ovens.

LOUISVILLE, KY.

The continued hot weather during the past week has had little effect upon the market, inasmuch as all the domestic business is confined to storage for next winter; however, the orders showed a tendency to slacken up during the week. The heavy movement into the North and Northwest continues unabated; there are also considerable orders from points in Iowa and Nebraska, indicating that the Kentucky product is steadily enlarging its field. Favorable prices are being made in this new trade, in some cases as much as 25c. below quotations offered the Southern consumer. On the other hand, prices made at some of the large southern competitive points, such as Louisville and Knoxville, where competition is keen, are often 25 to 30c. below those prevailing in more competitive districts.

There has been little change in the steam coal situation, the market remaining rather weak. Production is still running considerably ahead of consumption, and dealers are having considerable difficulty in placing these grades. Western Kentucky pea and slack continue to lead in excess supply, and are being freely offered at 35c. f.o.b. mines, with the better grades of nut and slack at 75c., and second grades at 50 to 60c. per ton.

The domestic grades for July shipments are holding fairly strong, some Jellico producers maintaining a minimum for June delivery of $1.90 on block, with indications that they may continue at this same figure through July; block and lump are held at $1.60 to $1.65, and round at $1.35. Most of the mines in the Eastern part of the State have had sufficient orders to keep them working full time, and indications are that this will continue until the customary fall demand opens up.

INDIANAPOLIS

Consumers are watching the market closely for the advance that now seems to be inevitable. It is said some of the local wholesalers are ready to make their first ante-winter raise but they have not been able to get unanimous action. They have not been any too successful in getting their orders filled at the Eastern mines, even when offering a premium. Their own customers have been taking coal from the yards liberally and they are not accumulating the surpluses they would like to have in the face of the present demand. The wheat harvest is on in Indiana and there is the threshing machine demand to fill now also.

There seems to be growing confidence that the basis for business—good crops—is assured. Indiana mines are not losing ground but instead are making slight gains. The factory situation is steadily becoming better, not in a very marked way, but enough to show it is moving in the right direction. Coal dealers in this city are beginning to talk about a difficulty in getting coal similar to that in effect last fall and consumers are deciding they will run no risk, so are ordering summer deliveries. All this causes a general strain that tends to advance prices. There are no changes in prices yet at Indiana mines, or with wholesalers and retailers.

The summer schedule in the retail yards of this city still prevails, quotations being as follows:

Anthracite, chestnut	$8.00	Hocking Valley lump	$4.50
Anthracite, stove and egg	7.75	Luhrig lump	4.50
Anthracite, grate	7.50	Luhrig washed egg	4.75
Pocahontas, forked lump	5.50	Cannel	6.50
Pocahontas, shoveled lump	5.00	Linton No. 4 lump	3.25
Pocahontas, mine run	4.00	Linton No. 4 egg	3.25
Pocahontas, nut and slack	3.50	Indiana washed egg	3.50
Blossburg	5.50	Brazil block	4.00
Jackson (Ohio)	5.25	Indianapolis lump coke	6.00
Kanawha lump	4.50	Indianapolis crushed coke	6.00
Kanawha egg, nut	4.50	Connellsville lump	7.00
Pittsburg lump	4.50	Citizens' egg coke	6.00
Raymond lump	4.50	Citizens' nut coke	6.00
Winifrede lump	4.50		

ST. LOUIS, MO.

Local conditions are improving slightly on the high grade fuels, but the Standard coals are still trying to reach a low record price. Retailers who are buying coal on contract are able to sell it to manufacturing plants at 75c. f.o.b. the mines for 2-in. lump coal.

Anthracite conditions are improving, while the smokeless demand is lagging back with no coal to take care of what little demand there is. The coke market has been brisk, but the chances are that it will slacken up some now, and coke will be plentiful in July.

Owing to the large number of mines shut down in the Carterville and Franklin County fields, such coal as is coming in is bringing a good price. There are a few inferior qualities, however, that are still hanging around the dollar price, but even then it is largely a matter of poor salesmanship that accounts for lack of a better figure.

It is understood that the Consolidation Coal Co. of Cin-

cinnati secured the coke contract from the Laclede Gas Light Co. running until Jan. 1, 1915. From now until Jan. 1, 1914 there will be about 10,000 tons of gas house coke, and for the following twelve months the production will be about 90,000 tons. This is about 20,000 tons more than the St. Louis market is able to take care of, and the price at which the contract went, it is rumored, is so high that cheaper outside cokes will give the local product brisk competition.

	Carterville and Franklin Co.	Big Muddy	Mt. Olive	Standard
2-in. lump	.....	.....	.....	$0.80@0.85
3-in. lump	.....	.....	$1.20	.....
6-in. lump	$1.15 @ 1.25	.....	1.20	0.85@0.90
Lump and egg	.....	$2.00	.....	.....
No. 1 nut	1.10 @ 1.20	.....	.....	.....
Screenings	0.80 @ 0.85	.....	.....	0.75@0.80
Mine-run	1.00 @ 1.10	.....	.....	0.75@0.80
No. 1 washed nut	1.40 @ 1.50	.....	.....	.....
No. 2 washed nut	1.25 @ 1.30	.....	.....	.....
No. 3 washed nut	1.25 @ 1.30	.....	.....	.....
No. 4 washed nut	1.25 @ 1.30	.....	.....	.....
No. 5 washed nut	1.00 @ 1.05	.....	.....	.....

St. Louis prices on June anthracite are: Chestnut, $7.15; stove and egg, $6.90; grate, $6.65. Smokeless lump and egg is $4.65 and mine-run $4. Byproduct coke is $5.10 and gas house $4.85.

PORTLAND, ORE.

While business is not now active, the season for placing orders for next winter will soon be open and hence dealers are looking for considerable activity in the near future. The market is steady and it is believed the demand for next winter will be greater than a year ago. Wood, which takes an important part in the local fuel situation, is selling at $5.50 per cord, which is about as low as it has been at this time for some years. This naturally has an effect on the coal trade for domestic purposes.

FOREIGN MARKETS

GREAT BRITAIN

June 13—Business is slow and as supplies are plentiful, an easy tone prevails in all sections.

Best Welsh steam	$4.80@5.04	Best Monmouthshires	$4.26@4.32
Best seconds	4.62@4.74	Seconds	4.08@4.20
Seconds	4.44@4.56	Best Cardiff smalls	2.40@2.52
Best dry coals	4.56@4.80	Seconds	2.28@2.40

British Exports—The following is a comparative statement of British exports for May and the first five months of the last three years, in long tons:

	May		5 Months		
	1912	1913	1911	1912	1913
Anthracite	196,423	251,117	986,525	784,220	1,188,283
Steam	4,659,433	4,318,911	19,138,316	14,791,968	21,636,454
Gas	1,120,763	929,955	4,215,605	3,326,247	4,523,898
Household	140,711	128,856	613,181	485,999	710,583
Other sorts	331,706	301,108	1,301,439	1,028,645	1,460,607
Total	6,449,036	5,929,747	26,255,066	20,416,679	29,589,825
Coke	48,765	71,944	392,889	336,900	424,334
Manufactured fuel	131,446	145,723	717,655	526,634	837,070
Grand total	6,629,247	6,147,614	27,365,610	21,280,282	30,781,229

PRODUCTION AND TRANSPORTATION STATISTICS

The Car Situation

American Ry. Association reports surpluses and shortages of coal equipment for two weeks ended June 14, as follows:

	Surplus	Shortage	Net*
New England Lines	6	85	79
N. Y.; New Jersey, Del.; Maryland; Eastern Penn.	715	0	**715**
Ohio; Indiana; Michigan; Western Pennsylvania	1,756	135	**1,621**
West Virginia, Virginia, North & South Carolina	939	1,202	263
Kentucky, Tenn.; Miss.; Alabama, Georgia, Florida	425	280	**145**
Iowa, Illinois, Wis., Minn.; North & South Dakota	1,706	152	**1,554**
Montana, Wyoming, Nebraska	398	0	**398**
Kansas, Colorado, Missouri, Arkansas, Oklahoma	2,000	128	**1,872**
Texas, Louisiana, New Mexico	263	4	**259**
Oregon, Idaho, California, Arizona	2,694	0	**2,694**
Canadian Lines	196	47	**142**
Totals	11,098	2,033	**9,065**
Greatest surplus in 1912 (Apr. 25)	94,692	2,144	**92,548**
Greatest shortage in 1912 (Oct. 10)	6,491	14,897	8,406

*Bold face type indicate a surplus.

NORFOLK & WESTERN RY.

The following is a statement of the tonnages shipped over this road during May, 1913, and for the five months ending May 31, as compared with corresponding periods of 1912 in short tons:

Destination	May		5 Months	
	1912	1913	1912	1913
Coal				
Tidewater, foreign	123,380	165,695	712,582	700,906
Tidewater, coastwise	379,303	340,073	1,516,662	1,640,744
Domestic	1,452,812	1,625,977	6,847,814	7,027,891
Coke				
Tidewater, foreign	12,687	5,857	37,834	22,841
Domestic	93,862	132,391	603,781	693,860
Total	2,062,044	2,269,993	9,718,673	10,086,422

PENNSYLVANIA RAILROAD

The following is a statement of shipments over the P. R.R. Co.'s lines east of Pittsburgh and Erie for May, and first five months of this year and last year in short tons:

	May		Five Months	
	1913	1912	1913	1912
Anthracite	967,898	109,341	4,641,994	3,688,943
Bituminous	4,178,271	3,495,016	20,092,450	18,956,936
Coke	1,238,083	1,150,080	6,225,387	5,340,912
	6,384,252	4,754,437	30,959,831	27,986,791

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending June 21.

Stocks	Week's Range			Year's Range	
	High	Low	Last	High	Low
American Coal Products	87	87	87	87	87
American Coal Products Pref.	109¼	109¼	109¼	109¼	109¼
Colorado Fuel & Iron	28	26⅜	26⅜	41⅜	24⅜
Colorado Fuel & Iron Pref.	....	....	155	155	150
Consolidation Coal of Maryland	102¼	102¼	102¼	102¼	102¼
Lehigh Valley Coal Sales	195	185	....	....	....
Island Creek Coal Com	50	48	48	....	....
Island Creek Coal Pref.	82	81	81	....	....
Pittsburgh Coal	16⅛	15⅝	15⅝	24⅜	14⅛
Pittsburgh Coal Pref.	76½	74½	74½	95	73
Pond Creek	17½	17½	17½	23⅜	17½
Reading	159½	154⅞	155	168⅜	151⅜
Reading 1st Pref.	....	....	86	92½	86
Reading 2nd Pref.	....	....	86	95	84
Virginia Iron, Coal & Coke	41¼	41¼	41¼	54	37½

Bonds	Closing Bid	Closing Asked	Week's Range or Last Sale		Year's Range	
Colo. F. & I. gen. s.f.g. 5s	93⅜	97	97	May '13	95	99½
Colo. F. & I. gen. 6s	..	..	107½	June '12	..	..
Col. Ind. 1st & coll. 5s. gu	78⅛	79¼	77½	June '13	77½	85
Cons. Ind. Coal Me. 1st 5s	..	..	85	June '11	..	..
Cons. Coal 1st and ref. 5s	..	94	93	Oct. '12	..	..
Gr. Riv. Coal & C. 1st g 6s	..	100	102⅜	April '06	..	..
K. & H. C. & C. 1st s f g 5s	..	..	98	Jan. '13	98	98
Pocah. Con. Coll. 1st s f 5s	..	87⅜	86	June '13	86	87½
St. L. Rky. Mt. & Pac. 1st 5s	70	76	76	June '13	76	80
Tenn. Coal gen. 5s	..	99⅞	100	May '13	100	103
Birm. Div. 1st consol. 6s	100½	102½	101	April '13	101	103
Tenn. Div. 1st g 6s	..	102	102	Feb. '13	102	102
Cah. C. M. Co. 1st g 6s	..	104	110	Jan. '09	..	..
Utah Fuel 1st g 5s	..	..	....	....	..	..
Victor Fuel 1st s f 5s	..	80	80	May '13	79¾	80
Va. I. Coal & Coke 1st g 5s	92	97	92	June '13	92	98

DIVIDENDS

Lykens Valley R.R. & Coal Co.—Dividend of 2%, payable July 1 to holders of record June 15.

Mine Hill & Schuylkill Haven—Dividend of $1.50 payable July 15 to holders of record June 20.

Reading Co.—Regular quarterly dividend of 2% on the common stock payable Aug. 14 to holders of record July 29. Regular quarterly on the first preferred of 1% payable Sept. 11 to holders of record Aug. 26. Regular quarterly on the second preferred of 1% payable July 10 to holders of record June 28.

St. Louis, Rocky Mountain & Pacific—Quarterly dividend No. 4 on preferred of 1¼% payable June 30 to holders of record June 21.

Central Coal & Coke Co.—Dividend of 1½% on the common and 1¼% on the preferred, both payable July 15 to holders of record July 1.

Island Creek Coal Co.—Regular quarterly on the common of 50c., and an extra dividend on the common of $3, payable Aug. 1 to holders of record July 15. Also regular quarterly on the preferred of $1.50 payable July 1 to holders of record June 25.

American Coal—In 1903 this company paid a 20 per cent. extra dividend from the proceeds of a sale of real estate and in 1907, a 25 per cent. distribution was declared from the sale of their railroad.

INDEX OF COAL LITERATURE

We will furnish copy of any article (if in print) in the original language for the price quoted. Where no price is quoted, the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for foreign papers. Remittance must be sent with order.

BLASTING, EXPLOSIVES

Blasting Accident at the Glückauf Mine in Westphalia, May 8, 1911. (Unfall bei der Schiessarbeit auf der Zeche Glückauf Tiefbau in Westfalen am 8. Mai 1911.) Zeit, f. d. Berg-Hütten- u. Salinenwesen, 1912; 6 pp., illus. 40c.

Permissible Explosives Tested Prior to March 1, 1913. Bureau of Mines, Tech. Paper 52; 7 pp.

Study of Magazines for Black Powder. Tests at Droitaumont of the Permanent Commission on Gas and Explosives. (Etude des Dépots de Poudre Noire.) Ann. des Mines, Vol. 3, No. 1, 1913; 40 pp., illus.

Use of High Explosives in Northern Mines. F. H. Gunsolus. Coll. Engr., June, 1913; 1 p. 40c.

BORING, SHAFT-SINKING & TUNNELING

Sinking Shaft III of the Minister Achenbach Colliery to the Coal Measures. (Das Abteufen des Schachtes III der Zeche Minister Achenbach bis zum Steinkohlengebirge.) Norkus. Bergbau, Apr. 24, May 1, 1913; 7 pp., illus. 80c.

COAL DUST

The Influence of Incombustible Dusts on the Inflammation of Gaseous Mixtures. Coll. Guard. Apr. 18 and 26, 1913; 5¼ pp., illus. 80c.

Dust Explosions. C. M. Young. Coal Tr. Bull., May 15, 1913; 3½ pp. 25c.

COKE

A New Coke Quenching, Screening and Loading Car. Gas World, May 3, 1913; 1 p., illus. 40c.

Bee-Hive Oven and By-Product Methods of Coke Manufacture Contrasted. Coal & Coke Op., June 5, 1913; 1½ pp. 20c.

Mechanical Coke Quenching and Loading Appliances of the Neumühl Colliery. (Maschinelle Kokslösch- und verladeeinrichtung der Zeche Neumühl.) Braunsteiner. Glückauf, Apr. 26, 1913; 4½ pp., illus. 40c.

Strength of Blast Furnace Coke. (Ueber dis Festigkeit von Hochofenkoks.) A. Wagener. Bergbau, May 15, 1913; 3¾ pp., 4 tables. 40c.

The Ostwald Process for Making Nitric Acid from Ammonia. Iron Coal Tr. Rev., May 23, 1913; 1¾ pp., illus. 40c.

The "Agglutinating Power" of Coals. (Paper read by J. T. Dunn before the Newcastle Section of the Soc. of Chem. Indus.) Iron Coal Tr. Rev., May 9, 1913, ¼ p. 40c.

The Rise and Development of By-Product Coking—III. Gas World, May 3, 1913; 1 p. 40c.

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EXPLOSIONS

Firedamp Explosion at the Osterfeld Workings I, II, III, of the Oberhausen Colliery, Rhineland, July 3, 1912. (Die Schlagwetterexplosion auf der Schachtanlage Osterfeld I, II, III des Steinkohlenbergwerks Oberhausen Rheinland, am 3. Juli 1912.) Koepe. Zeit. f. d. Berg- Hutten- u. Salienenwesen, 1912; 7½ pp., illus. 40c.

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A Modification of the Jäger Method of Gas Analysis. S. H. Worrell. Met. & Chem. Eng., May, 1913; 2½ pp., illus. 35c.

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